

GRADUATE CATALOG

2025-2026



UNIVERSITY OF NORTH CAROLINA
CHARLOTTE

Phone Numbers & Address

If, after reading this *Catalog*, students have further questions or specific inquiries about the programs of, or admission to, The University of North Carolina at Charlotte, they may look below to find the proper office to contact.

Correspondence may be addressed to any of the offices by following this format:

The University of North Carolina at Charlotte
Attn: *Department or College*
9201 University City Boulevard
Charlotte, NC 28223-0001

INFORMATION

Campus Operator/Switchboard.....	704-687-8622 (UNCC)
Admissions	
Undergraduate	704-687-5507
Graduate.....	704-687-5503
Summer School.....	704-687-1283
Adult Students and Extended Services.....	704-687-5104
Advising Center.....	704-687-7717
Athletics	
.....	704-687-1054
Bookstore.....	704-687-7050
Bursar	704-687-5506
Colleges	
Arts + Architecture.....	704-687-0100
Business.....	704-687-7577
Computing and Informatics.....	704-687-8450
Education.....	704-687-8722
Engineering.....	704-687-8244
Graduate School.....	704-687-5503
Health and Human Services.....	704-687-8374
Honors College.....	704-687-7197
Humanities & Earth and Social Sciences.....	704-687-0088
Science.....	704-687-0057
University College.....	704-687-5630
Continuing Education.....	704-687-8900
Counseling and Psychological Services.....	704-687-0311
Dean of Students.....	704-687-0345
Dining Services and Meal Plans.....	704-687-7337
Disability Services.....	704-687-0040
Distance Education.....	704-687-1283
Financial Aid.....	704-687-5504
Housing and Residence Life.....	704-687-7501
ID Office	704-687-7337
International Programs.....	704-687-7755
IT Service Desk.....	704-687-5500
Library	704-687-0494
Niner Central.....	704-687-5504
Parking and Transportation Services.....	704-687-0161
Student Engagement/Student Union.....	704-687-7100
Student Health.....	704-687-7400
University Career Center.....	704-687-0795
University Center for Academic Excellence.....	704-687-7837
University Recreation.....	704-687-0430
University Registrar.....	704-687-5505
University Scholarship Office	704-687-5871

EMERGENCY NUMBERS

Campus Police -- Emergency	704-687-2200 or 911
Non-Emergency Calls.....	704-687-8300
Inclement Weather Hotline	704-687-1900

Acknowledgements

This *Catalog* was prepared and published by the Office of Academic Affairs in June 2025. Its goal is to provide a comprehensive, accurate, and useful catalog, which fully describes the academic programs, policies, regulations, and requirements of the University.

Although the publisher of this *Catalog* has made every reasonable effort to attain factual accuracy herein, no responsibility is assumed for editorial, clerical or printing errors, or errors occasioned by mistakes. The publisher has attempted to present information that, at the time of preparation for printing, most accurately describes the course offerings, faculty listings, policies, procedures, regulations, and requirements of the University. However, it does not establish contractual relations. The University reserves the right to alter or change any statement contained herein without prior notice.

We request that omissions and inaccuracies be brought to the attention of the Editor, as well as any suggestions and comments on the presentation and content.

Catalog Compilation

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UNIVERSITY OF NORTH CAROLINA CHARLOTTE

THE UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

Graduate Catalog 2025-2026 Vol. XXII

Fall 2025, Spring 2026, Summer 2026

<https://catalog.charlotte.edu>

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The University of North Carolina at Charlotte is committed to equality of educational opportunity and does not discriminate against applicants, students, or employees based on race, color, religion, sex, sexual orientation, gender identity, age, national origin, physical or mental disability, veteran status, or genetic information. In keeping with this commitment, UNC Charlotte ensures that diverse persons of any background are invited, included, and treated equally.



Welcome to UNC Charlotte, North Carolina's urban research university, where great things are happening.

UNC Charlotte is enjoying a strong wave of momentum. Last fall, the University climbed to #81 among the nation's top public universities in the 2025 U.S. News & World Report Best Colleges rankings. In the last five years, we have moved up 76 spots overall and are now one of the top 10 fastest rising universities in the U.S. We also ranked #45 among US News' Most Innovative Schools, the only public university in NC to rank in this category.

In 2021, the University set a bold vision for the future to be a top-tier globally recognized research university. That vision became reality in February 2025 when our achievement of Carnegie R1 ("very high research activity") status was announced. This milestone reflects the dedication and innovation of our faculty and staff, and is an indication of the positive trajectory that we are on.

Graduate students are key drivers of the research enterprise and are essential to Charlotte attaining and maintaining R1 status.

If you decide to work toward your graduate degree at UNC Charlotte, please think of our dedicated faculty and staff as partners in your success. Their expertise and support, along with the many University resources and services

available to you, will enable you to meet your academic, personal and professional aspirations.

During your time at Charlotte, explore all the possibilities available. Take advantage of leadership and volunteer opportunities; attend cultural events and lectures; join a student organization; participate in intramural sports; and cheer on your Charlotte 49ers whenever they are competing.

It is truly a privilege to serve as your chancellor. Please know that I will do everything in my power to support and strengthen our academic enterprise, ensure a great college experience for you, and always place the highest priority on the safety and well-being of our campus community.

I am delighted that you have chosen to pursue your graduate studies at Charlotte. Go Niners!

Sincerely,

Sharon L. Gaber
Chancellor



If this is your first year at UNC Charlotte, welcome to our dynamic community! If you are returning, we are pleased to welcome you back.

You are part of an engaged and enterprising university that is interconnected with North Carolina's largest city. Because we are situated in a growing and dynamic region, our institution is alive with possibilities to learn and grow. As you explore the academic opportunities available, know that we believe in your ability to succeed.

You will be taught by the best professors, mentors, researchers and advisors. Our faculty are creative. No matter what discipline they teach, they find new and inspiring methods to spark their students' desires to learn and to grow. And they are experts at building connections - with students, with other disciplines, with practical applications and with our greater community.

Remember, too, that there is more to the collegiate experience than coursework. I encourage you to become involved in some of the many activities or student organizations. By getting involved, you will build relationships with both your fellow students and our faculty and staff that you will cherish for years to come.

I hope you will take advantage of the excellent resources available here and explore all that our campus has to offer. But don't stop there - explore research, community engagement and professional development opportunities in the greater Charlotte area and in the world beyond. We're here to help you get started.

We are pleased that you have chosen UNC Charlotte. As our University continues to grow, we look forward to you continuing to grow with us as a person, a scholar and a future alum.

Sincerely,

Jennifer Troyer
Provost and Vice Chancellor for Academic Affairs



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Academic Calendar

2025-2026

UNC Charlotte's academic year is divided into three terms: Fall, Spring, and Summer. These full terms are divided into half terms.

FALL 2025

Aug 11	Academic year begins
Aug 18	First day of classes (Full Term & First Half Term)
Aug 23	First day of classes (Saturdays)
Aug 30	No Saturday classes
Sep 1	HOLIDAY: Labor Day
Oct 1	Last day of classes (First Half Term)
Oct 3-6	Final examinations (First Half Term)
Oct 9-10	Fall Recess
Oct 14	First day of classes (Second Half Term)
Oct 27	Registration for Spring 2026 begins
Nov 11	HOLIDAY: Veteran's Day
Nov 26-29	HOLIDAY: Thanksgiving
Dec 2	Last day of classes (Full Term & Second Half Term)
Dec 3	Reading day
Dec 4-6, 8-10	Final examinations (Full Term & Second Half Term)
Dec 12-13	Fall Commencement

SPRING 2026

Jan 12	First day of classes (Full Term & First Half Term)
Jan 10	First day of classes (Saturdays)
Jan 19	HOLIDAY: M.L. King, Jr. Day
Feb 25	Last day of classes (First Half Term)
Feb 26	Reading Day (First Half Term)
Feb 27 – Mar 2	Final examinations (First Half Term)
Mar 9-14	Spring Break
Mar 16	First day of classes (Second Half Term)
Mar 30	Registration for Summer 2026 and Fall 2026 begins
Apr 10-11	Refresh Weekend
Apr 29	Last day of classes (Full Term & Second Half Term)
Apr 30	Reading Day (Full Term & Second Half Term)
May 1-2, 4-7	Final examinations (Full Term & Second Half Term)
May 8-9	Spring Commencement
May 11	Academic year ends

SUMMER 2026

May 25	HOLIDAY: Memorial Day
May 18 – Jun 24	Summer First Half Term*
May 18 - Aug 5	Summer Full Term*
Jun 25-27	No classes
Jul 3	HOLIDAY: Independence Day
Jun 29 - Aug 5	Summer Second Half Term*

*Dates include final examinations.

Please note: All dates are subject to change. No classes are held on the above noted holiday dates. A complete list of dates and deadlines is available online from the Office of the Registrar at registrar.charlotte.edu/printable-calendar. Please check this site for current information.

AUGUST 2025

S	M	T	W	Th	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

SEPTEMBER 2025

S	M	T	W	Th	F	S
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28	29	30				

OCTOBER 2025

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NOVEMBER 2025

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30						

DECEMBER 2025

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21	22	23	24	25	26	27
28	29	30	31			

JANUARY 2026

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25	26	27	28	29	30	31

FEBRUARY 2026

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22	23	24	25	26	27	28

MARCH 2026

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15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

APRIL 2026

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MAY 2026

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31						

JUNE 2026

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28	29	30				

JULY 2026

S	M	T	W	Th	F	S
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5	6	7	8	9	10	11
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19	20	21	22	23	24	25
26	27	28	29	30	31	



Introduction to the Catalog

Reader's Guide to the Graduate Catalog

The *University of North Carolina at Charlotte Graduate Catalog* (hereby referred to as the "Catalog") is the official source of the University's academic programs and courses. The Catalog should be used as a guide, in conjunction with an academic advisor, in planning a course of study and in meeting requirements for graduation.

Publication Schedule

The Catalog is published annually in the Summer for the following academic year, which begins in the Fall. Although course offerings and academic requirements at UNC Charlotte are continually under examination and revision, the Graduate Catalog is updated only once per year. This annual revision procedure helps ensure that users of the Catalog will not find unexpected changes during their academic planning processes.

The Graduate Catalog is Divided into Three Major Sections

The first section contains information about the academic calendar, the graduate programs offered, admission to The Graduate School, student conduct, degree requirements and academic regulations, and financial information, including tuition and fees and financial aid.

The second (or curricular) section describes the University's academic programs in detail. The section is organized in alphabetical order by the seven academic colleges, plus the School of Data Science, followed by each individual program, including related courses and their descriptions.

The third and final section contains a faculty directory and glossary of higher education terminology. Rounding out this section is an index which is helpful in locating a topic quickly.

What's New This Year

New Programs

New graduate programs and catalog sections that appear for the first time in this *Catalog* include:

Master's Programs with New Concentrations

- Architecture, M.Arch., and Architecture, M.S., Dual Degree
- Architecture (Critical Heritage Studies Concentration), M.S. and Anthropology, M.A., Dual Degree
- Economics, M.S. and Economics, M.Sc. Dual Degree
- M.S. in Mathematical Finance/Master's in Finance Dual Degree (*in conjunction with Central University of Finance and Economics (CUFE)*)
- M.S. in Mathematical Finance/Master's in Quantitative Finance Dual Degree (*in conjunction with College of Technology Management at National Tsing Hua University (NTHU)*)

Doctorate Programs

- Data Science, Ph.D.

Doctorate Programs with New Concentrations

- Applied Mathematics, Ph.D. – Statistics Concentration

Program Changes

Major changes to existing graduate degrees and programs include:

Discontinued Programs

- Network Security, Graduate Certificate
- Nursing: Adult Psychiatric Mental Health, M.S.N.
- Secure Software Development, Graduate Certificate

Additional Changes

- The Graduate Certificate in Anti-Racism has been renamed to Self, Systems and Social Transformations (SSST), Graduate Certificate.
- The Graduate Certificate in Entrepreneurship and Innovation has been renamed to Corporate Venturing, Graduate Certificate.
- The Mathematical Finance, M.S. and International Business, Master's, Dual Degree program has been renamed to Mathematical Finance, M.S., and Finance, Master's, Dual Degree (SUFE)

Catalog Policies and Disclaimers

The *UNC Charlotte Graduate Catalog* is not an irrevocable contract. Regulations published in it are subject to change by the University at any time without notice. University regulations are policy statements to guide students, faculty, staff, and administrative officers in achieving the goals of the institution. Necessary interpretations of these policies will be made by the appropriate authorities with the interest of the students and the institution in mind. Students are encouraged to consult an advisor if they have questions about the application of any policy.

The University reserves the right to change any of its policies, rules, and regulations at any time, including those relating to admission, instruction, and graduation. The University also reserves the right to withdraw curricula and specific courses, alter course content, change the calendar, and to impose or increase fees. All such changes are effective as proper authorities determine and may apply not only to prospective students, but also to those who are already enrolled in the University.

The requirements specified in this *Catalog* apply to students who commence their studies at UNC Charlotte during the academic year specified in this catalog and who remain in continuous enrollment at the institution until they graduate. If requirements are changed, students may elect to comply with the new requirements or to remain under the requirements by which they are governed at the time of

the change. The choice to apply the new requirements must be declared by students at least one semester prior to graduation through their academic departments.

Students who change their major/minor are bound by the requirements of their new major/minor that are in effect the semester they officially begin studies in the new program.

Students who are readmitted to the University are bound by the program and degree requirements in force at the time of readmission.

Exceptions to these policies may be necessitated by changes in course offerings, degree programs, or by action of authorities higher than the University. In that event, every effort will be made to avoid penalizing the student.

Student Responsibility

Each student is responsible for the proper completion of their academic program, for familiarity with the *Catalog*, for maintaining the grade point average required, and for meeting all other degree requirements. Students assume academic and financial responsibility for the courses in which they enroll and are relieved of these responsibilities only by formally terminating enrollment. The advisor will counsel, but the final responsibility remains that of the student.

A student is required to have knowledge of and observe all policies and regulations pertaining to campus life and student behavior. Students are encouraged to familiarize themselves with academic terminology located in the Glossary section of this *Catalog*.

Email is the official form of communication at the University; each student is responsible for checking their charlotte.edu email regularly, as well as maintaining communication with the University and keeping a current address and telephone number on file with the Office of the Registrar.

While associated with the University, each student is expected to participate in campus and community life in a manner that will reflect favorably upon the student and the University. The University has enacted two codes of student responsibility -- **The UNC Charlotte Code of Student Academic Integrity** and **The UNC Charlotte Code of Student Responsibility** -- which are summarized in this *Catalog* and available in full online at legal.charlotte.edu/policies/chapter-400. As students

willingly accept the benefits of membership in the UNC Charlotte academic community, they acquire obligations to observe and uphold the principles and standards that define the terms of UNC Charlotte community cooperation and make those benefits possible. This includes completion of institutional surveys as requested by the University for program assessment and improvement.



Graduate Academic Programs

COLLEGE AND PROGRAM	GRADUATE DEGREE			
	<u>Certificate</u>	<u>Master's</u>	<u>Doctorate</u>	<u>Early Entry Program</u>
<i>College of Arts + Architecture</i>				
Architecture		MArch, Architecture MS/History, MA, Architecture and Architecture, MS, Dual Degree, MArch/MUD, MS, Architecture MS/MUD, Dual Degree Architecture, MS and Anthropology, MA		Available
Art Education (<i>interdisciplinary</i>)	Graduate			
Urban Design		MUD, MArch/MUD		
<i>Belk College of Business</i>				
Accountancy		MACC		Available
Business Administration	MBA PLUS Post-Master's	MBA, MBA/MA, MBA/MHA, BA/MSRE	DBA, PhD	
Corporate Venturing	Graduate			
Data Science and Business Analytics (<i>interdisciplinary</i>)	Graduate	MS		Available
Economics	Graduate	MS, MS/MSc., Dual Degree		Available
Global Business and Strategy	Graduate	MBA		
Management		MS		
Mathematical Finance (<i>interdisciplinary</i>)		MS, MS/LM, MS/Master's		Available
Organizational Science (<i>interdisciplinary</i>)			PhD	
Real Estate	Graduate	MSRE, MSRE/MBA		
<i>College of Computing and Informatics</i>				
Applied Artificial Intelligence	Graduate			

COLLEGE AND PROGRAM	GRADUATE DEGREE			
	<u>Certificate</u>	<u>Master's</u>	<u>Doctorate</u>	<u>Early Entry Program</u>
Bioinformatics		MS		Available
Bioinformatics and Computational Biology			PhD	
Bioinformatics Technology	Graduate			Available
Computer Science		MS, MS/MArch		Available
Computing and Information Systems			PhD	
Cybersecurity		MS		
Data Science			PhD	
Data Science and Business Analytics (<i>interdisciplinary</i>)	Graduate	MS		Available
Game Design and Development	Graduate			
Health Informatics and Analytics (<i>interdisciplinary</i>)	Graduate	MS, MHA/MS, MPH/MS		Available
Human-Computer Interaction	Graduate			
Information Security and Privacy	Graduate			
Information Technology	Graduate	MS, MS/MArch		Available
Software Development	Graduate			
<i>Cato College of Education</i>				
Advanced Literacy Instruction and Intervention	Graduate			
Applied Behavior Analysis	Graduate			
Art Education (<i>interdisciplinary</i>)	Graduate			
Child and Family Studies	Graduate	MAT		
Counseling - Addiction Counseling	Graduate	MA		
Counseling - Clinical Mental Health Counseling		MA		
Counseling – School Counseling	Post Master's	MA		
Counselor Education and Supervision			PhD	
Curriculum and Instruction			PhD	
English/Language Arts (Middle Grades and Secondary Education)	Graduate	MEd, MAT		
Mathematics (Middle Grades and Secondary Education)	Graduate	MEd, MAT		
Science (Middle Grades and Secondary Education)	Graduate	MEd, MAT		
Social Studies (Middle Grades and Secondary Education)	Graduate	MEd, MAT		
Teaching English as a Second Language (Middle Grades and Secondary Education)	Graduate	MEd, MAT		
Career and Technical Education (Business, Family and Consumer Services, Marketing, Technology)	Graduate	MAT		
Early Childhood Mental Health	Graduate			
Educational Leadership		MEd	EdD	
Educational Research, Measurement, and Evaluation			PhD	
Elementary Education	Graduate	MEd, MAT		Available
Elementary School Mathematics	Graduate			Available
Foreign Language Education	Graduate	MAT		Available
Instructional Coaching	Graduate			
Learning, Design, and Technology	Graduate	MEd	Ph.D.	Available
Play Therapy	Graduate			
Qualitative Research	Graduate			

10 Academic Programs

COLLEGE AND PROGRAM	GRADUATE DEGREE			
	<u>Certificate</u>	<u>Master's</u>	<u>Doctorate</u>	<u>Early Entry Program</u>
Quantitative Research	Graduate			
Reading Education		MEd		Available
School Administration	Post-Master's	MSA		
Self, Systems and Social Transformations (SSST)	Graduate			

Cato College of Education (continued)

Special Education			PhD	
Academically or Intellectually Gifted	Graduate	MEd		Available
Adapted Curriculum	Graduate	MEd, MAT		
Autism Spectrum Disorders	Graduate			
Child Development	Graduate	MEd		
General Curriculum	Graduate	MEd, MAT		
Teaching English as a Second Language	Graduate	MAT		
Urban Education		MEd		
University and College Teaching	Post-Master's			

The William States Lee College of Engineering

Applied Energy and Electromechanical Engineering	Graduate	MS		Available
Civil Engineering		MSCE	PhD	Available
Computer Engineering		MS		
Construction and Facilities Engineering		MS		Available
Electrical Engineering		MSEE	PhD	Available
Engineering Management		MS		Available
Engineering, General		MSE		
Fire Protection and Safety Management		MS		
Infrastructure & Environmental Systems (interdisciplinary)			PhD	
Mechanical Engineering		MSME	PhD	Available
Optical Science & Engineering (interdisciplinary)		MS	PhD	Available

College of Health and Human Services

Athletic Training		MS		
Epidemiology (interdisciplinary)			PhD	
Health Administration		MHA, MHA/MS, MHA/MBA		Available
Health Informatics and Analytics (interdisciplinary)	Graduate	MS, MHA/MS, MSPH/MS		Available
Health Psychology (interdisciplinary)			PhD	Available
Kinesiology		MS		Available
Nursing				
Applied Nursing Informatics	Graduate			
Nurse Anesthesia Across the Lifespan			DNP	
Nursing – Advanced Clinical Nursing				Available
Adult-Gerontology Acute Care Nurse Practitioner	Post-Master's	MSN		
Family Nurse Practitioner Across Lifespan	Post-Master's	MSN		
Nursing – Systems/Population Nursing				Available
Nurse Administrator	Graduate	MSN		
Nurse Educator	Graduate	MSN		

Community/Public Health Nursing		MSN		
Nursing Practice			DNP	
Public Health	Graduate	MPH, MPH/MS, MPH/MA	PhD	Available
Respiratory Care	Graduate	MS		
Social Work		MSW		
<i>College of Humanities & Earth and Social Sciences</i>				
Anthropology		MA, MA/MPH		Available
Cognitive Science	Graduate			
Communication Studies		MA		Available
Criminal Justice	Graduate	MS		Available
Earth Sciences		MS		Available
Emergency Management	Graduate			
English		MA, MA/MFA		Available
Ethics and Applied Philosophy	Graduate	MA		Available
Gender, Sexuality, and Women's Studies	Graduate			
Geography		MA	PhD	Available
Gerontology	Graduate			Available
Health Psychology (<i>interdisciplinary</i>)			PhD	Available
History		MA		Available
Infrastructure & Environmental Systems (<i>interdisciplinary</i>)			PhD	
Interdisciplinary Studies		MA		
Languages, Cultures and Translation				Available
French	Graduate			Available
German	Graduate			Available
Japanese	Graduate			Available
Russian	Graduate			Available
Spanish	Graduate	MA		Available
Latin American Studies		MA, MBA/MA		Available
Linguistics, Applied	Graduate			
Nonprofit Management	Graduate			
Optical Science & Engineering (<i>interdisciplinary</i>)		MS	PhD	Available
Organizational Science (<i>interdisciplinary</i>)			PhD	Available
Psychology		MA		
Psychology, Industrial/Organizational		MA		
Public Administration		MPA		Available
Public Budgeting and Finance	Graduate			
Public Policy	Graduate		PhD	
Religious Studies		MA		Available
Sociology		MA		Available
Technical/Professional Writing	Graduate			
Urban Management and Policy	Graduate			
<i>Klein College of Science</i>				
Biology		MS	PhD	Available
Biomedical Sciences	Graduate			
Biotechnology	Graduate			
Chemistry		MS		Available
Chemistry and Nanoscale Science (<i>interdisciplinary</i>)			PhD	

12 Academic Programs

Mathematical Finance (<i>interdisciplinary</i>)		MS		Available
Mathematics		MS		Available
Mathematics, Applied			PhD	
Nanoscale Science		MS	PhD	
Optical Science and Engineering		MS	PhD	
Physics, Applied		MS		Available
<i>School of Data Science</i>				
Data Science and Business Analytics (<i>interdisciplinary</i>)	Graduate	MS		Available
Health Informatics and Analytics (<i>interdisciplinary</i>)	Graduate	MS, MPH/MS, MHA/MS		Available
<i>Graduate School</i>				
Workplace Competencies	Graduate			

ACCREDITATIONS

Accreditation is important for the University to be able to receive and distribute state and federal funds. Also, accreditation is important for the acceptance and transfer of college credits. The Assistant Provost for Institutional Effectiveness and Analytics serves as the accreditation liaison for the University and is responsible for assuring that compliance with accreditation requirements is incorporated into planning and evaluation processes of the institution.

Institutional accrediting bodies, such as the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), conduct comprehensive reviews of institutions of higher education. This review ensures that "the institution (1) has a mission appropriate to higher education, (2) has resources, programs, and services sufficient to accomplish and sustain that mission, and (3) maintains clearly specified educational objectives that are consistent with its mission and appropriate to the degrees it offers and that indicate whether it is successful in achieving its stated objectives" (Principles of Accreditation: Foundations for Quality Enhancement). The accreditation granted encompasses the entire institution including all degree programs, instructional sites, and online programs.

UNC Charlotte

UNC Charlotte is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) to award baccalaureate, master's, and doctoral degrees. UNC Charlotte also may offer credentials such as certificates and diplomas at approved degree levels. Questions about the accreditation of UNC Charlotte may be directed in writing to the Southern Association of Colleges and Schools Commission on Colleges at 1866 Southern Lane, Decatur, GA 30033-4097, by calling (404) 679-4500, or by using information available on SACSCOC's website (www.sacscoc.org).

The University of North Carolina at Charlotte was reaffirmed by SACSCOC for the next ten years. The decision was made at the December 2023 Annual Meeting of the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC).

College of Arts + Architecture

The Bachelor of Architecture and Master of Architecture are accredited professional degree programs as recognized by the National Architectural Accrediting Board (NAAB).

The Bachelor of Arts in Art, Bachelor of Fine Arts in Art, Bachelor of Fine Arts in Graphic Design, and Bachelor of Arts in Art History are accredited degree programs as recognized by the National Association of Schools of Art and Design (NASAD).

The Bachelor of Arts in Music and Bachelor of Music are accredited degree programs as recognized by the National Association of Schools of Music (NASM).

The University of North Carolina at Charlotte is an accredited institutional member of the National Association of Schools of Dance (NASD).

All arts education programs leading to K-12 licensure (art, dance, music, and theatre education) are accredited by their national accrediting body (the National Association of Schools of Art and Design, National Association of Schools of Dance, National Association of Schools of Music, and National Association of Schools of Theatre) and approved as Educator Preparation Programs by the North Carolina Department of Public Instruction (NCDPI).

College of Business

The programs in business and accounting are accredited by AACSB International, the Association to Advance Collegiate Schools of Business. AACSB International is the premier accrediting agency for bachelor's, master's, and doctoral degree programs in business administration and accounting.

College of Education

The College's professional education programs for BK-12 teachers, counselors, and administrators are approved by the North Carolina Department of Public Instruction (NCDPI) and accredited by the Council for the Accreditation of Educator Preparation (CAEP).

Counseling programs in Counselor Education are accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP).

College of Engineering

The baccalaureate programs in civil, computer, electrical, mechanical, and systems engineering are accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

The civil, electrical, and mechanical engineering technology baccalaureate programs are accredited by the Engineering Technology Accreditation Commission of ABET, www.abet.org.

The construction management baccalaureate program is accredited by the Engineering Technology Accreditation Commission and the Applied and Natural Science Commission of ABET, www.abet.org.

College of Health and Human Services

The baccalaureate degree in nursing/master's degree in nursing/Doctor of Nursing Practice and/or post-graduation APRN certificate at the University of North Carolina at Charlotte is accredited by the Commission on Collegiate Nursing Education (www.ccnaccreditation.org).

The undergraduate nursing programs are approved by the North Carolina Board of Nursing.

The Nursing Anesthesia program is accredited by the Council on Accreditation of Nurse Anesthesia Education Programs (COA).

The Exercise Science program is accredited by the Commission on Accreditation of Allied Health Education programs (www.caahep.org) upon the recommendation of the Commission on Accreditation for the Exercise Sciences (CoAES).

The Clinical Exercise Physiology concentration of the Master of Science in Kinesiology is accredited by the Commission on Accreditation of Allied Health Education programs (www.caahep.org) upon the recommendation of the Commission on Accreditation for the Exercise Sciences (CoAES).

The Bachelor of Science in Respiratory Therapy (program #500001) and Master of Science in Respiratory Care (program #520001) at UNC Charlotte have been provisionally accredited by the Commission on Accreditation for Respiratory Care (coarc.com). CoARC accredits respiratory therapy education programs in the United States. To achieve this end, it utilizes an 'outcomes-based' process. Programmatic outcomes are performance indicators that reflect the extent to which the educational goals of the program are achieved and by which program effectiveness is documented (coarc.com/students/programmatic-outcomes-data).

The Master of Health Administration program is accredited by the Commission on Accreditation of Healthcare Management Education (CAHME).

The Public Health programs (BSPH, MPH, Ph.D. in Public Health Sciences, and Ph.D. in Health Services Research) are accredited by the Council on Education for Public Health (CEPH).

Both the Bachelor of Social Work (BSW) and the Master of Social Work (MSW) are accredited by the Council on Social Work Education (CSWE).

College of Humanities & Earth and Social Sciences

The Public Relations program within the Department of Communication Studies is certified by the Public Relations Society of America (PRSA).

The Clinical Psychology program within the Ph.D. in Health Psychology is accredited by the American Psychological Association (APA).

The Master of Public Administration program is accredited by the National Association of Schools of Public Affairs and Administration (NASPAA).

Klein College of Science

The Department of Chemistry is on the approval list of the American Chemical Society.

Graduate School

The University is a member of the Council of Graduate Schools, the Conference of Southern Graduate Schools, and The North Carolina Conference of Graduate Schools.



About the University

northcarolina.edu
charlotte.edu

THE UNIVERSITY OF NORTH CAROLINA SYSTEM

In North Carolina, all of the public educational institutions that grant baccalaureate degrees are part of The University of North Carolina System. The oldest public university system in the nation, UNC traces its roots to the state's 1776 constitution, which held that "All useful Learning shall be duly encouraged and promoted in one or more Universities." Today, nearly 225,000 students are enrolled on 16 university campuses across the state and at the NC School of Science and Mathematics, the country's first public, residential high school for gifted students.



History

Chartered by the North Carolina General Assembly in 1789, the University of North Carolina was the first public university in the United States to open its doors and the only one to graduate students in the eighteenth century. The first class was admitted in Chapel Hill in 1795. For the next 136 years, the only campus of the University of North Carolina was at Chapel Hill.

Additional institutions of higher education, diverse in origin and purpose, began to win sponsorship from the General Assembly beginning as early as 1877. Five were historically

black institutions, and another was founded to educate Native Americans. Some began as high schools. Several were created to prepare teachers for the public schools. Others had a technological emphasis. One is a training school for performing artists.

The 1931 session of the General Assembly redefined the University of North Carolina to include three state-supported institutions: (1) the campus at Chapel Hill (now the University of North Carolina at Chapel Hill), (2) North Carolina State College (now North Carolina State University at Raleigh), and (3) Woman's College (now the University of North Carolina at Greensboro). The new multi-campus University operated with one board of trustees and one president. By 1969, three additional campuses had joined the University through legislative action: (4) the University of North Carolina at Charlotte, (5) the University of North Carolina at Asheville, and (6) the University of North Carolina at Wilmington.

In 1971, legislation was passed bringing into the University of North Carolina the state's ten remaining public senior institutions, each of which had until then been legally separate: (7) Appalachian State University, (8) East Carolina University, (9) Elizabeth City State University, (10) Fayetteville State University, (11) North Carolina Agricultural and Technical State University, (12) North Carolina Central University, (13) the North Carolina School of the Arts (now the University of North Carolina School of the Arts), (14) Pembroke State University (now the University of North Carolina at Pembroke), (15) Western Carolina University, and (16) Winston-Salem State University. In 1985, the NC School of Science and Mathematics was declared an affiliated school of the University; in July 2007, NCSSM by

legislative action became a constituent institution of the University of North Carolina.

Board of Governors

The UNC Board of Governors is the policy-making body charged with “the general determination, control, supervision, management, and governance” of the University of North Carolina. Its 28 voting members are elected by the NC General Assembly for four-year terms. Former board chairs may continue to serve for limited periods as non-voting members emeriti. The president of the UNC Association of Student Governments or that student’s designee is also a non-voting member.

President and UNC System Office

The chief executive officer of the University of North Carolina System is the President. The President is elected by and reports to the Board of Governors. The President’s office is the operations level between the constituent institutions and the Board of Governors. The President has complete authority to manage the affairs and execute the policies of the University of North Carolina and its constituent institutions, subject to the direction and control of the Board of Governors.

Chancellors

Each of the UNC campuses is headed by a Chancellor who is chosen by the Board of Governors on the President’s nomination and is responsible to the President.

Board of Trustees

Each UNC campus has a local Board of Trustees that holds extensive powers over academic and other operations of its campus on delegation from the Board of Governors.

Shared Governance

The UNC System operates under an arrangement of shared governance that leverages the collective strengths of its campus chancellors and administrators, local boards of trustees, and the UNC President and Board of Governors. The UNC System also honors the important traditional role of the faculty in the governance of the academy.

HISTORY OF THE UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE

UNC Charlotte is one of a generation of universities founded in metropolitan areas of the United States immediately after World War II in response to rising education demands generated by the war and its technology.

To serve returning veterans, North Carolina opened 14 evening college centers in communities across the state. The Charlotte Center opened Sept. 23, 1946, offering evening classes to 278 freshmen and sophomore students in the facilities of Charlotte’s Central High School. After three years, the state closed the centers, declaring that on-campus facilities were sufficient to meet the needs of returning veterans and recent high school graduates.

Charlotte’s education and business leaders, long aware of the area’s unmet needs for higher education, moved to have the Charlotte Center taken over by the city school district and operated as Charlotte College, offering the first two years of college courses. Later the same leaders asked Charlotte voters to approve a two-cent tax to support that college.

Charlotte College drew students from the city, Mecklenburg County and from a dozen surrounding counties. The two-cent tax was later extended to all of Mecklenburg County. Ultimately financial support for the college became a responsibility of the State of North Carolina.

As soon as Charlotte College was firmly established, efforts were launched to give it a campus of its own. With the backing of Charlotte business leaders and legislators from Mecklenburg and surrounding counties, land was acquired on the northern fringe of the city and bonds were passed to finance new facilities. In 1961, Charlotte College moved its growing student body into two new buildings on what was to become a 1,000-acre campus 10 miles from downtown Charlotte.

Three years later, the North Carolina legislature approved bills making Charlotte College a four-year, state-supported college. The next year, 1965, the legislature approved bills creating the University of North Carolina at Charlotte, the fourth campus of the statewide university system. In 1969,

the University began offering programs leading to master's degrees. In 1992, it was authorized to offer programs leading to doctoral degrees.

Today, with an enrollment ranking it third among the 17 schools in the UNC system, it is the largest public university in the greater Charlotte metropolitan region. A doctoral institution, UNC Charlotte serves the region through applied research, knowledge transfer, and engaged community service.

Nearly 1,100 full-time teaching faculty comprise the University's academic departments, and the Fall 2024 enrollment was over 31,000 students, including over 6,200 graduate students.

MISSION, VISION, AND VALUES OF UNC CHARLOTTE

University Mission Statement

UNC Charlotte is a leading urban research university with a significant local-to-global impact. We transform lives, communities, and industries through accessible and affordable education, offering exemplary bachelor's, master's, doctoral, and professional programs. Our commitment to scholarship, innovation, and service drives our contributions to the ever-evolving needs of society. Through strategic partnerships and a focus on real-world applications, we prepare our graduates to excel in their careers and lead with purpose and integrity in a rapidly changing world. See the Mission Statement at <https://chancellor.charlotte.edu/about-unc-charlotte/mission-statement/>.

University Vision and Values

In fulfilling our mission, we envision a University that promises:

- An accessible and affordable quality education that equips students with intellectual and professional skills, ethical principles, and an international perspective.
- A strong foundation in liberal arts and opportunities for experiential education to enhance students' personal and professional growth.
- A robust intellectual environment that values social and cultural diversity, free expression, collegiality, integrity, and mutual respect.

- A safe, diverse, team-oriented, ethically responsible, and respectful workplace environment that develops the professional capacities of our faculty and staff.

To achieve a leadership position in higher education, we will:

- Rigorously assess our progress toward our institutional, academic, and administrative plans using benchmarks appropriate to the goals articulated by our programs and in our plans.
- Serve as faithful stewards of the public and private resources entrusted to us and provide effective and efficient administrative services that exceed the expectations of our diverse constituencies.
- Create meaningful collaborations among university, business, and community leaders to address issues and opportunities of the region.
- Develop an infrastructure that makes learning accessible to those on campus and in our community and supports the scholarly activities of the faculty.
- Pursue opportunities to enhance personal wellness through artistic, athletic, or recreational activities.
- Operate an attractive, environmentally responsible and sustainable campus integrated with the retail and residential neighborhoods that surround us.

Approved by the Board of Governors on April 11, 2014.

GRADUATION RATE DISCLOSURE STATEMENT

Our data shows that 65.1% of the full-time new freshmen who entered UNC Charlotte in Fall 2014 have received a baccalaureate from UNC Charlotte as of Fall 2020. In addition, another 2.2% were enrolled at UNC Charlotte in pursuit of their baccalaureate degree as of Fall 2020. This information is provided pursuant to requirements of the Student Right-to-Know and Campus Security Act of 1990.

NONDISCRIMINATION

The University of North Carolina at Charlotte is committed to providing a respectful, safe, and inclusive environment for all University community members and guests of the University. The University affirms that its educational and employment decisions must be based on the abilities and

qualifications of individuals and may not be based on irrelevant factors, including personal characteristics, that have no connection with academic abilities or job performance. Therefore, the University prohibits discrimination and discriminatory harassment in its educational and employment decisions and provides equal opportunities for all members of the University community and for all those seeking to join the University community.

The following factors may not form the basis for educational or employment-related decisions: race; color; religion, including belief and non-belief; sex; sexual orientation; gender identity; age; national origin; physical or mental disability; veteran status; and genetic information. See University Policy 501, Nondiscrimination, at legal.charlotte.edu/policies/up-501.

Anyone may report alleged violations of University Policy 501 to the University's Office of Civil Rights and Title IX. All University employees are expected to report alleged violations of this Policy to the University's Office of Civil Rights and Title IX and may be subject to disciplinary action, up to and including dismissal, for failing to report.

For complaints of Title IX Sexual Harassment (as that term is defined by University Policy 504, Title IX Grievance Policy) against a student, faculty member, or staff member, see University Policy 504, Title IX Grievance Policy.

The University's Office of Civil Rights and Title IX will contact the individual who reportedly experienced a violation of this Policy and discuss with the individual available accommodations, resources, and resolution options. The University's Office of Civil Rights and Title IX will assist the individual in utilizing the applicable University process for that individual's report, as set forth on the Office of Civil Rights and Title IX website.

The University strictly prohibits retaliation against individuals for reporting alleged violations of federal law or for cooperating in the University's investigation of alleged violations of federal law. Retaliation includes threatening, intimidating, or coercive behaviors and other adverse actions that would deter a reasonable person in the same or similar circumstances from reporting alleged violations of federal law or cooperating in the University's investigation of any such report, even if the behaviors do not ultimately have that effect.

If you have discrimination concerns, please see the UNC Charlotte Notice of Nondiscrimination for the contact information of individuals who may assist you. This notice and the University's grievance procedures for making a complaint of discrimination may be found online at

<https://civilrights.charlotte.edu/resources-university-policies/notice-nondiscrimination>.

UNIVERSITY STRUCTURE

UNC Charlotte is organized into five administrative divisions: Academic Affairs, Business Affairs, Institutional Integrity, Student Affairs, and University Advancement. These divisions, as well as Athletics, OneIT, and Research all report to the Chancellor.

Academic Affairs

The Division of Academic Affairs provides administrative oversight and academic leadership. It includes Academic Budget & Personnel; Center for ADVANCing Faculty Success; Enrollment Management; the Graduate School; the Honors College; Institutional Effectiveness and Analytics; International Programs; the Library; Office of Undergraduate Education; School of Professional Studies; urbanCORE; and the eight discipline-based academic colleges: the Colleges of Arts + Architecture, Business, Computing and Informatics, Education, Engineering, Health and Human Services, Humanities & Earth and Social Sciences, and Science.

Business Affairs

Business Affairs plans for and provides essential human, financial, facility, and administrative support services to the University that are customer-focused, results-oriented, fiscally sound, and integrity-bound. The Division of Business Affairs includes Business Services; Facilities Management; Financial Services; Human Resources; Safety and Security; and Budget.

Institutional Integrity

The Division of Institutional Integrity supports UNC Charlotte in its endeavors to achieve its academic mission and strategic plan while adhering to the University's ethical, legal, and regulatory responsibilities. The Division of Institutional Integrity consists of the Office of Legal Affairs, the Office of Ethics, Policy, and Compliance, the Office of Civil Rights and Title IX, the Internal Audit Department, and the Enterprise Risk Management Department.

Student Affairs

The Division of Student Affairs advances the educational mission of the University by creating welcoming, student-centered learning environments where students excel academically and develop personally into their best selves. The Division of Student Affairs consists of Counseling and Psychological Services (CAPS); Center for Integrated Care; Center for Wellness Promotion; Cone University Center;

Dean of Students Office; Housing and Residence Life; Leadership & Community Engagement; Niner Finances; Office of Fraternity and Sorority Life; Popp Martin Student Union; Student Accountability & Conflict Resolution; Student Affairs Marketing & Communications; Student Affairs Research & Assessment; Student Assistance and Support Services; Student Health; Student Involvement; Student Niner Media; Advising and Support; Transition & Success Initiatives; UNC Charlotte Student Legal Services, Inc.; University Recreation; Venture Outdoor Leadership; and Veteran Services.

University Advancement

The Division of University Advancement supports the mission of the University by cultivating alumni, community, and government support and affinity, by raising funds for scholarships and major initiatives, by providing and coordinating community engagement opportunities, and by providing broad based communications leadership that articulates the mission of the University to the region, state and nation. The Division includes Advancement Operations, Alumni Engagement, Development, University Communications, and University Events & Special Programs.

CAMPUSES

Main Campus

The University of North Carolina at Charlotte is the largest institution of higher education in the Charlotte region and is a genuine urban university. The main campus is in University City, one of the fastest growing areas of the Charlotte region, located off WT Harris Boulevard on NC 49 near its intersection with US 29, and only eight miles from the interchange of Interstates 85 and 77. Campus facilities are comprised of contemporary buildings, including many constructed in the past ten years and more on the way. In addition to classrooms and well-equipped laboratories, the University offers arts and athletic facilities, dining facilities, and residence accommodations. The campus is designed for the pedestrian, and facilities are generally accessible to students with disabilities.

Dubois Center at UNC Charlotte Center City

The Dubois Center at UNC Charlotte Center City functions as a gateway between the city of Charlotte and the University and as such embodies UNC Charlotte's urban identity in the heart of the greater Charlotte region.

Home to the School of Professional Studies, the building bustles with working professionals and adult learners who

are able to conveniently access continuing education programs ranging from 1-day workshops, to short-format certificates and boot camps, to degrees.

In addition to professional programming, The Dubois Center facilitates academic programs having an urban awareness and context, while providing vital learning opportunities for employees and residents of the urban center.

Architecturally, it reflects its mission as a premier institution of higher education; its context in this vibrant, rapidly urbanizing area; and its commitment to environmental sustainability.

Operationally, it incorporates the attributes we wish to instill in the entire University: excellence in programming, responsiveness to stakeholders, entrepreneurship, interdisciplinary productivity, inclusivity, flexibility, and efficiency.

ACADEMIC BUILDINGS

Albert & Freeman EPIC

The Energy Production and Infrastructure Center (EPIC) at UNC Charlotte was formed in response to the need from industry to supply highly trained engineers qualified to meet the demands of the energy industry – through traditional and continuing education, and provide sustainable support to the Carolina energy industry by increasing capacity and support for applied research. EPIC is a highly collaborative industry/education partnership that produces a technical workforce, advancements in technology for the global energy industry while supporting the Carolinas' multi-state economic and energy security. It was dedicated on November 16, 2012.

In October 2020, the EPIC building was named the Albert & Freeman Energy Production and Infrastructure Center to recognize and honor alumni Craig and Darla Albert. The generosity of the Alberts, especially throughout Exponential: The Campaign for UNC Charlotte, established both the Albert Engineering Leadership Scholars program and the Freeman Scholarship, both housed in the University's Honors College.

The Albert Engineering Leadership Scholars Program invests in superior students who have demonstrated excellence in the areas of academic achievement, leadership and community engagement. Albert Scholars serve as the next generation of leaders who will make dynamic contributions to the field of engineering. The program offers students a full, four-year scholarship, along with academic support and

the professional guidance necessary to achieve their educational and professional goals.

The Freeman Scholarship provides renewable scholarship support to students pursuing any major who are eligible for one of the University's honors programs. The Freeman Scholarship is open to incoming first-year students eligible for a Federal Pell Grant or other federal grant aid programs. The scholarship places a strong emphasis on commitment to academics.

Craig Albert earned a bachelor's degree in mechanical engineering from the Lee College of Engineering in 1985 and currently serves as president and chief operating officer of Bechtel Group Inc., the largest engineering and construction firm in the United States. He is responsible for the management and oversight of the firm's global operations and serves on the company's board of directors. Darla Albert earned a bachelor's degree in business administration from UNC Charlotte's Belk College of Business in 1983.

EPIC is home to the Department of Civil and Environmental Engineering and Department of Electrical and Computer Engineering.

Atkins Library

The J. Murrey Atkins Library, the third building to be constructed on the UNC Charlotte campus, is named for J. Murrey Atkins, the son of a prominent Gastonia family, successful Charlotte businessman and one of the University's founding members.

Atkins, born in Russellville, Ky., graduated from Gastonia High School. At Duke University, he served as editor of the yearbook and earned a bachelor's degree in 1927. He attended Harvard Law School and Columbia University and spent five years in New York with the Irving Trust Co. before returning to Charlotte. In 1935, he joined the city's leading investment firm R.S. Dickson and Co., where he was president from 1954 until his death.

Atkins was involved with Charlotte College from its inception. He was chair of the college advisory committee for eight years and chair of the Charlotte Community College System when it was authorized in 1958. When UNC Charlotte became a four-year college, he served as chair of the board of trustees.

Sensitive to the social and educational needs of the community, Atkins believed that the Charlotte region needed a public institution of higher learning to stay competitive with other cities in the state. He used his business, financial and political contacts to help Charlotte College become that institution. "Charlotte College was

started to meet an emergency and has continued as a necessity," Atkins was fond of saying.

Charlotte College shared a library facility with Central High School. Mozelle Scherger was hired as the first full-time librarian in 1957, when a daytime instructional program was launched. When the college was formally accredited that fall, the number of volumes in the library exceeded 6,000.

Atkins believed the library should be central on the campus, central in student service and the very focal point of learning. When the library was first moved to the new campus, it was temporarily housed in the W. A. Kennedy Building.

The pioneering leader would not live to see the current library adorned with his name. He died Dec. 2, 1963, and the J. Murrey Atkins Library was dedicated on April 19, 1965. The state legislature appropriated \$20.5 million for an expansion in 1995. It was re-dedicated in 2001.

Dalton Library Tower

The Harry L. Dalton Library Tower was completed and dedicated in 1971, and re-dedicated in 2001. It is named in honor of Harry Lee Dalton, distinguished Charlotte business leader and patron of the arts, whose gifts stimulated the development of the Library's Special Collections.

Barnard

The Barnard Building was completed in 1969. It is named in honor of Bascom Weaver Barnard, a founder and first chairman of The Charlotte College Foundation, and first executive director of The Foundation of the University of North Carolina at Charlotte.

Bascom "Barney" Weaver Barnard established the Charlotte College Foundation and served as its first chair. His name features prominently in the early years of UNC Charlotte, and it adorns an 18,000 square-foot building completed in 1969, designed to serve as a facility for instruction and research.

Born Feb. 14, 1894, Barnard was a native of Asheville. He graduated from Trinity College (now Duke University) and completed a master's degree from Princeton University in 1917. He returned to his alma mater, where he taught economics and served as alumni secretary and graduate manager of athletics until 1922. He eventually left academia for the private sector.

Starting in 1939, Barnard worked as an executive for American Commercial Bank (later NCB, now Bank of America), American Discount Company and the American

Credit Corporation while maintaining a busy roster of civic activities. He served on the board of Family and Children Service, the Salvation Army and as chair of the National Affairs Committee of the Charlotte Chamber of Commerce. In 1966, he received one of Charlotte's highest civic honors - the Civitan Distinguished Citizenship Award.

In that same year, Barnard founded Charlotte College Foundation, which by 1971 had raised \$4.5 million for the fledgling University; since then, the foundation has since raised significantly more to support scholarship and academic programming at UNC Charlotte. He served as the foundation's secretary and executive director and established the University's Patrons of Excellence Program, which solicited gifts of \$10,000 or more from individuals, foundations and corporations.

On May 30, 1971, the UNC Charlotte Academic Council presented Barnard with a resolution stating "Scholarships, professorships, research grants, additions to the library collection, faculty recruitment – all these and more have flourished at his hand. In short, he has helped to provide the margin that leads to excellence." Barnard died Sept. 27, 1980.

The Barnard building is one of the five buildings that make up the original quad of UNC Charlotte. Today, Barnard is home to the Department of Anthropology, Adult Students and Extended Services, and Veteran Student Services.

Bioinformatics

The Bioinformatics Research Center opened in 2009 as a teaching and research building located on tWest Campus. It is a multifunctional facility which fosters an interdisciplinary academic and entrepreneurial program. The center also supports the nearby "Biopolis" (the North Carolina Research Center) through biotechnology efforts in plant genomics, health, and gene-related research.

The Bioinformatics Building is home to the Department of Bioinformatics and Genomics.

Burson

Sherman Burson Jr. was the first Charles Stone Professor of Chemistry and the inaugural dean of the-then College of Arts and Sciences.

A native of Pittsburgh, Pa., Burson was born Christmas Eve 1923. His father, a Methodist minister, moved the family to Massachusetts, where Burson graduated from Harwich High School. Uncertain of his career goals, Burson considered becoming a surgeon, psychologist or medical researcher.

With little money for college, Burson took the advice of his high school principal and moved South where college costs were lower. He spent the 1941-42 academic year at the University of Alabama. When money ran out, he returned to Pennsylvania, where he worked in a steel mill during the day and attended the University of Pittsburgh at night. World War II was under way, and Burson entered the U.S. Army. A special program enabled him to continue studies at Louisiana State University; following the war, he returned to the University of Pittsburgh, where he completed a bachelor's degree in chemistry. He earned a doctorate in 1953.

In 1957, after nearly five years in private industry, Burson decided to pursue a career in academia. He joined the faculty of Pfeiffer College in Misenheimer. At the urging of Bonnie Cone, Burson accepted a position at Charlotte College in 1963. He was a professor of chemistry and chair of the department when Charlotte College became the fourth campus of the University of North Carolina in 1965. It was under Burson that the department achieved accreditation from the American Chemical Society.

UNC Charlotte's first chancellor, Dean Colvard, appointed Burson acting dean of the College of Science and Mathematics in 1973, and in 1980, Chancellor E.K. Fretwell named him dean of the newly formed College of Arts and Sciences (now the College of Humanities & Earth and Social Sciences), formed by the merger of the College of Science and Mathematics with the College of Humanities and the College of Social and Behavioral Sciences. He held this post until retiring in June 1985.

Completed in summer 1985, the Sherman L. Burson Building was originally dedicated as the Physical Sciences Building. The 104,000-square-foot facility includes a 184-seat tiered lecture hall, a number of smaller lecture halls and laboratory space. Designed by Peterson Associates of Charlotte, the building was constructed by Butler and Sidbury Inc. for a little more than \$8 million. At the time of its re-dedication in April 1999, the building was noted for its planetarium platform mounted on vibration-resistant pedestals, an underground Van de Graaf linear accelerator and reinforced concrete radiation labs.

The building's design won a national architectural award and was included in the American School and Universities Architectural Portfolio for 1986.

Today, Burson is home to the Department of Chemistry, College of Computing & Informatics, and Physics and Optical Science.

Beginning in late 2025, the Burson building is scheduled to undergo a comprehensive 104,000

square-foot renovation and 45,000-square foot expansion. Upon completion in 2027, Burson will become home to the College of Engineering, the College of Computing and Informatics, and the School of Data Science.

The renovated Burson will feature a Super Fab Lab, new research space for each of the colleges, and additional active learning style classrooms. A key focus of the renovation is improved student space to foster collaboration, consolidate advising resources, and create an identifiable home for undergraduate students in these colleges.

Cameron

The C.C. Cameron Applied Research Center recognizes an individual whose civic and business leadership contributed to the development of UNC Charlotte and the entire UNC system.

Clifford Charles Cameron was born in Meridian, Miss. He later attended Louisiana State University, where he completed a bachelor's degree in chemical engineering in 1941. Following service in World War II, he worked as an engineer for Standard Oil Co. At the urging of a war buddy, Cameron changed careers and became a mortgage banker in 1949. He entered this relatively new field with the creation of Cameron Mortgage Co. in Raleigh. The company merged with Brown-Hamel Mortgage Co. of Greensboro in 1955 and acquired the Carolina Realty Co. of Charlotte. This was the beginning of the Cameron-Brown Co. that would later combine with First Union.

Following that merger, Cameron moved to Charlotte, where he became chief executive officer of First Union in 1968. His affiliation with UNC Charlotte dates to 1967, when Cameron became a member of the board of directors of the UNC Charlotte Foundation. In the early 1980s, Cameron co-chaired UNC Charlotte's first capital campaign and played a leadership role in the University's Silver Anniversary Campaign. He also served as on the UNC Charlotte Board of Trustees and the UNC Board of Governors.

Through his involvement with the UNC Charlotte Foundation, Cameron is credited with helping to create University Place and the subsequent economic development that resulted. He also played a part in the development of the Ben Craig Center.

Chancellor emeritus E.K. Fretwell noted in a magazine article that "Cliff Cameron personifies corporate responsibility... He is giving of his management expertise, his leadership, his great prestige and his personal attention to assist the University of North Carolina at Charlotte in its

quest for excellence."

Before retiring as First Union chair in 1984, Cameron laid the groundwork for its growth as one of the nation's top 20 banks. Committed to public service, Cameron served as an advisor to North Carolina governors for four decades. He was a member of Gov. Luther Hodge's Business Development Corp., Gov. Dan Moore's Council for Economic Development; Gov. Bob Scott's Conservation and Development Board and Gov. Hunt's Advisory Budget Commission and Transportation Study Commission. Under Gov. James Martin, Cameron served as an assistant for budget and management.

One of the University's most prestigious scholarships bears the name of C.C. Cameron in recognition of First Union's and his personal contributions that made the financial assistance possible. In honor of his service to the University and the state, UNC Charlotte awarded Cameron an honorary Doctor of Public Service in 1983.

Completed in 1990 and dedicated on Sept. 25, 1991, the Cameron Applied Research Center contained roughly 74,000 square feet of laboratory, office and conference space to support world-class research. At the time, the center was the focal point for the University's outreach mission to the region. It provided businesses, agencies and organizations access to academic and applied research expertise. A multipurpose facility, the center was designed for maximum flexibility to accommodate evolving research projects. It features vibration-free spaces, a 96-seat auditorium and a media center equipped for teleconference and distance learning.

In 2000, the center was renovated and expanded to add roughly 42,000 square feet of space.

Today, the building is known as Cameron Hall and is home to the University Writing Program, Writing Resources Center, and Department of Systems Engineering and Engineering Management.

Cato

Dedicated May 6, 2004, Cato Hall is often the first point of contact for prospective students interested in enrolling at the state's urban research institution. Named for Wayland H. Cato Jr., the building houses the Chancellor's Office, Enrollment Management, Institutional Integrity, Office of Academic Affairs, and the Office of Assessment and Accreditation.

A distinguished business leader and philanthropist, Cato was born in Ridge Spring, S.C., in 1923. His father, Wayland Cato Sr. worked for United Merchants and Manufacturers (UM&M), a New York-based textile

conglomerate. The elder Cato moved his family to Augusta, Ga., in 1937, where the younger Cato attended the Academy of Richmond County, a compulsory ROTC military public school. He graduated with honors in 1940.

Cato Jr. enrolled at UNC-Chapel Hill and was elected to Beta Gamma Sigma, a national honorary scholastic commerce fraternity. He also joined the Naval Reserve Officers Training Corps. In 1944, Cato graduated in the top three percent of his class with a bachelor's degree in commerce.

During World War II, he served nearly three years on active duty in the U.S. Navy, stationed aboard minesweepers in the Pacific Theatre.

Following his discharge, Cato joined his father and other family members in Charlotte. The elder Cato had left UM&M to start his own business, which became the Cato Corporation, a chain of women's apparel stores. Cato Jr. became president and chief executive officer of the family business in 1960. He added the title chair of the board of directors in 1970. He retired as chair emeritus in 2004; his son John Cato was named CEO in 1999.

From 1995 to 2002, Cato Jr. was a director of the UNC Charlotte Foundation. Personally and corporately, he endowed a number of scholarship programs at the University. For his leadership in business in the Carolinas and service to the nation, state and community and for his commitment to learning and scholarship, Cato was awarded an honorary Doctor of Humane Letters during commencement in May 2002.

Conceived as the Humanities Office Wing, Cato Hall originally housed Undergraduate Admissions and the Graduate School, along with the Development Office and the departments of Communication Studies and Social Work. The three-story, 32,500-square-foot facility was built for \$5.1 million using bonds approved by state voters in 2000 and other University funds.

Colvard

The Colvard Building opened in 1979, and its steel-frame and curtain-wall construction and many energy saving features were considered progressive for its time. Harry Wolf of Wolf Associates designed the structure, and he won the 1980 South Atlantic Regional AIA Honor Award for his work. Among the energy-saving features Wolf utilized were vermiculite insulate roofing, insulated walls and a heat reclaimer. Also, the center arcade was designed for the horizontal and vertical movement of students in a space that did not need to be heated or cooled.

While many of Wolf's design techniques are common today, 30 years ago they were considered forward-thinking. It is appropriate such a building honors Dean Wallace Colvard, UNC Charlotte's first permanent chancellor, a man considered ahead of his time in many respects.

Born in 1913, Colvard was raised in the mountains of western North Carolina in Ashe County. President and salutatorian of his high school class, Colvard was the first member of his family to attend an institution of higher learning. He started at Berea College in 1931, where he earned a scholarship. He also met Martha Lampkin; they would wed in the college's Danforth Chapel in 1939.

After completing his undergraduate degree, Colvard earned a master's degree in endocrinology from the University of Missouri and a doctorate in agricultural economics from Purdue University. He also served as superintendent of North Carolina Agricultural Research Stations from 1938-46. In 1948, Colvard was hired to run North Carolina State University's animal science program. Five years later, he became the dean of agriculture, a post he held until 1960, when he became president of Mississippi State University (MSU), where he unintentionally became part of college sports history. MSU had won three straight Southeastern Conference championships, but the institution declined to participate in the NCAA tournament rather than integrate, even briefly, on the basketball court. In 1963, Colvard defied a court injunction and allowed the MSU basketball team to compete in the tournament against a team with African-American players.

Colvard returned to his native state in 1966 after being named chancellor of UNC Charlotte. He embraced the challenge of turning a pioneering junior college into a university that had become the fourth member of the consolidated UNC system. As chancellor, he secured regional and national accreditation for University programs, helped create the University Research Park, added graduate programs, expanded the campus and oversaw the growth of the student body from 1,700 to 8,705 students.

He retired Dec. 31, 1978, but Colvard did not leave education behind. He helped build two other institutions: the School of Science and Mathematics at Durham and the hands-on museum Discovery Place. He died June 28, 2007.

Today, Colvard is home to the Departments of Communication Studies, Criminal Justice and Criminology, and Psychological Science; Organizational Science, School of Data Science, Office of Undergraduate Education,

University Advising Center, University College, School of Professional Studies, and the University Center for Academic Excellence.

Cone University Center

Since first opening its doors in 1962, the Cone University Center has been a gathering place for students, faculty, staff, administrators, alumni and guests. As such, it is fitting that the facility bears the name of Bonnie Ethel Cone, the beloved mathematics teacher and visionary administrator who, perhaps more than anyone else, is credited as UNC Charlotte's founder.

Born June 22, 1907, in Lodge, S.C., "Miss Bonnie," as she was affectionately called, taught high school in South Carolina for 12 years before moving to Charlotte's Central High School in 1940. During World War II, she taught math to men enrolled in the navy's V12 program at Duke University, and she spent a year working as a statistical analyst for the Naval Ordnance Laboratory in Washington, D.C.

Cone's background made her the perfect person to head one of the new extension centers established in the late 1940s to serve returning war veterans. Cone directed the Charlotte Center and signed on as a part-time instructor in engineering and math.

Always a firm believer that Charlotte needed a public university, Cone was determined to see one built in the Queen City. She helped turn the temporary veteran's center into a permanent two-year college. In 1963, she played a key role in convincing the North Carolina General Assembly to make Charlotte College a part of the University of North Carolina system. On July 1, 1965, Bonnie Cone stood beside Gov. Dan Moore to ring the bell announcing the official creation of the University of North Carolina at Charlotte.

"Miss Cone has provided the faith on which the college many times found its primary ability to exist," said J. Murrey Atkins in a tribute. "She has stuck with it and never even thought of giving up when sometimes the sledding seemed pretty hard."

Cone served as acting chancellor for nine months and remained committed and loyal to UNC Charlotte. She served as vice chancellor for student affairs and community relations until she retired in 1973. On June 29, as part of her retirement service, the UNC Charlotte Board of Trustees named the University Center in her honor. In retirement, Cone continued to raise money and support the University until her death in 2003.

Today, Cone is home to Niner Central, University

Scholarship Office, Office of Fraternity and Sorority Life, Cone Center Conferences, College of Computing & Informatics, and Main Street Market.

Denny

In 1965, a new campus facility designed by Odell Associates was completed at a cost of \$569,000. Five years later, the building was dedicated in honor of Mary Rebecca Denny, chair of the UNC Charlotte English Department for 14 years.

Denny was born on Aug. 12, 1896, on the family farm near the small town of Red Springs, N.C. She attended Salem College and taught English in several public schools in eastern North Carolina after completing her bachelor's degree in 1917. She went on to earn a master's degree from Duke University and become associate professor of English at Queens College. She left Queens in 1946 to become the first full-time faculty member at the Charlotte Center of the University of North Carolina (now UNC Charlotte).

Although the Charlotte Center was created to serve in an emergency situation, Denny believed that it would eventually provide more than a temporary opportunity for its students. She was right as the Charlotte Center became Charlotte College, one of the first two-year community colleges in North Carolina, in 1949.

During the next 15 years, Denny completed an impressive list of initiatives, including the creation of the college newspaper, the literary magazine and the college catalog. When Charlotte College became a four-year institution, Denny relinquished her role as department head, but she remained active with the Curriculum Committee. She retired in 1964, with the distinction of being the institution's first professor emeritus.

At the Oct. 9, 1970, dedication ceremony naming what was then the largest classroom building in her honor, UNC Charlotte trustees enthusiastically paid tribute - "We transform glass, steel and stone into a monument to your spirit - forthright, steadfast, energetic and humanitarian. May this building forever serve as a reminder of your commitment to the ideals of sound scholarship, integrity and excellence."

Following her retirement, Denny returned to her family home in Red Springs, where she resided until her death in 1979.

The Denny building is one of the five buildings that make up the original quad of UNC Charlotte.

Dubois

With the retirement of UNC Charlotte's fourth chancellor in 2020, the University's Center City Building was renamed The Dubois Center at UNC Charlotte Center City (The Dubois Center) to recognize Chancellor Philip L. Dubois and First Lady Lisa Lewis Dubois. The building is regarded as a centerpiece to Dubois' 15-year term as chancellor.

Dubois' career in higher education spans more than 40 years. As a first-generation college student, he earned a bachelor's degree in political science in 1972 from the University of California, Davis, and a master's (1974) and doctoral (1978) degree in political science from the University of Wisconsin-Madison. Dubois returned to the University of California, Davis, to start his career in academia as an assistant professor, rising through faculty and administrative ranks to hold various positions, including full professor and associate vice chancellor for academic programs.

In 1991, Dubois was recruited to UNC Charlotte, where he spent five and a half years as provost and vice chancellor for academic affairs. Under his leadership, UNC Charlotte planned and implemented its first doctoral programs. He led the creation of a strategic academic plan, which included creating programs to reach more nontraditional students, recognizing that as an important goal for an institution founded to educate veterans.

In 1997, Dubois left UNC Charlotte to become president of the University of Wyoming, where he led the development and implementation of comprehensive academic, support services and capital construction plans, expanded the University's role in statewide economic development, and improved student recruitment and retention.

In 2005, Dubois returned to UNC Charlotte and was named chancellor. During his 15-year tenure, he led the University through a 43% growth in enrollment, an expansion of academic programs, the implementation of diversity-related initiatives, growth in research funding and the construction and renovation of campus facilities. He increased the University's visibility in the Charlotte region and beyond, with undergraduate enrollment reaching nearly 30,000 under his leadership, led the largest facility construction and renovation program in UNC Charlotte's history, and under Dubois' strategic direction, football was added to the University's athletics offerings in 2013.

Dubois collaborated with elected officials and the Charlotte Area Transit System to make possible the construction of the light rail line from Center City Charlotte to the UNC Charlotte campus, increasing the connection and opportunities for partnership between the University

and the rest of the city. He oversaw the implementation of new academic degree programs — 10 bachelor's, 17 master's, and 12 doctoral — and established or helped in the development of new offices to support students. To reach more non-traditional students, Dubois implemented the award-winning 49er Finish program, which helps students who left the University to complete their degrees, and partnered with Central Piedmont Community College to launch the 49erNext program, which creates a clear path for community college students to enroll at UNC Charlotte. Dubois worked with Charlotte-Mecklenburg Schools to create two early colleges at UNC Charlotte, one for students interested in STEM fields and another for those interested in teaching.

The Dubois Center opened in fall 2011 and is the only University of North Carolina classroom building conceived and designed specifically to serve the business, organizations, and people of an urban center. Its 25 state-of-the-art classrooms and design studios accommodate more than 1,500 students annually who earn bachelor's or master's degrees in business, architecture, urban design, education, public administration or health administration, plus about 2,600 more who participate in certificate and other continuing education options. In addition, The Projective Eye Gallery, located near the lobby, regularly exhibits the work of artists known locally, nationally and internationally.

The Dubois Center hosts over 2,000 meetings and events annually and includes both university and community constituents.

Duke Centennial

Duke Centennial Hall was dedicated on September 8, 2006, in honor of Duke Energy's century of service and its commitment to leadership for the future.

Duke Energy's history in the Carolinas dates back to 1904, when its first power station was built on the Catawba River. Cheap hydroelectric power helped transform the regional economy from agriculture to manufacturing.

In the 21st Century, our economy continues to change. Duke Energy partnered with UNC Charlotte to help establish the Office of Research Partnerships (formerly Charlotte Research Institute) to advance technology, foster innovation, and drive economic growth in our region.

Duke Centennial is home to the College of Engineering, Mosaic Lab, Center for Precision Metrology, and the Department of Mechanical Engineering and Engineering Science.

Fretwell

The E.K. and Dorrie Fretwell Building honors the campus contributions of UNC Charlotte's second chancellor and his wife.

At the time of its dedication on May 23, 1996, the 162,000-square-foot facility was the largest academic structure on campus. It contains approximately 250 faculty offices and classroom seating for about 2,100 students. Built for \$18 million, the four-story facility was constructed with revenues from a bond issue approved by North Carolina voters in a November 1993 referendum.

The son of two teachers, E.K. Fretwell was born in New York City. He earned a bachelor's degree at Wesleyan University, a master's in teaching from Harvard University and a doctorate from Columbia University. An Associated Press correspondent, writer for the American Red Cross, vice consul for the American Embassy in Prague and middle and high school teacher, Fretwell entered education administration in 1956 as assistant commissioner for higher education for the New York State Board of Regents. He also served as dean for academic development at the City University of New York and president of the State University of New York College at Buffalo. In addition, he was president of the American Association for Higher Education and chair of the Carnegie Foundation for the Advancement of Teaching.

A national leader in education, Fretwell became UNC Charlotte's second chancellor in January 1979. At the time, the University's enrollment was around 8,700 students. By his retirement in June 1989, UNC Charlotte's enrollment topped 13,000.

During his tenure, Fretwell merged the College of Humanities, Social, and Behavioral Sciences and College of Science and Mathematics into the College of Arts and Sciences (now the College of Humanities & Earth and Social Sciences) and created the Graduate School. Besides enhancing UNC Charlotte's national reputation for educational excellence, Fretwell increased the institution's links to the community through the expansion of the Urban Institute and University Research Park, the development of University Place and establishment of the C.C. Cameron Applied Research Center.

Throughout his career, Fretwell relied upon his wife Dorrie; he was quoted often as saying they were a team. Born in Chicago, Dorrie Shearer Fretwell grew up in Evanston, Ill. She earned bachelor's and master's degrees in applied music at Drake University. Before her marriage, Fretwell studied voice at the American School of Music in Fontainebleau, France, and began her career as a professional soprano, performing as a soloist with choral

societies, musical clubs and opera productions on stage and television. During her husband's tenure in Buffalo, Fretwell served as vice chair of the board of the Buffalo Philharmonic Orchestra and vice president of the Girl Scouts. In Charlotte, she was on the board of Opera Carolina and the Charlotte Symphony. Among the initial enrollees of UNC Charlotte's graduate program in clinical psychology, she was its first graduate. She went into practice with Carolina Psychological Services and published a number of articles related to depression and headache management before retiring in 1996. She passed away December 30, 2011.

At the University's formal ceremony to dedicate the E.K. and Dorrie Fretwell Building, Allan Ostar, president emeritus of the American Association of State Colleges and Universities, noted "as a magnificent center of learning, it is a fitting tribute to a towering educational leader."

Today, Fretwell is home to the College of Humanities & Earth and Social Sciences; Departments of English, Mathematics and Statistics, Political Science and Public Administration, and Sociology, American Studies, Liberal Studies, Women's and Gender Studies programs, Political Science & Public Administration, Interdisciplinary Studies, and Disability Services.

Friday

The Ida and William Friday Building houses the Belk College of Business, and it honors the many contributions of William C. Friday to the University of North Carolina system.

Born in Raphine, Va., Friday grew up in the Gaston County town of Dallas, where he played baseball and basketball. He attended N.C. State University, graduating with a bachelor's degree in textile manufacturing. As a senior, Friday met Ida Howell from Lumberton who was pursuing a bachelor's degree in home economics at Meredith College. They married on May 13, 1942, and Bill Friday continued his education at UNC-Chapel Hill where he earned a law degree. Ida Friday also furthered her studies, obtaining a master's in public health from UNC-Chapel Hill.

Friday spent the majority of his career in higher education. He was assistant dean of students at UNC-Chapel Hill, assistant to the president of the Consolidated University of North Carolina and secretary of the University of North Carolina. At age 36, Friday was named acting president of the UNC system. He would lead the system until 1986. During his tenure, he became recognized as one of America's most respected and effective educational leaders. Through the 1963 Higher Education Act, Friday redefined the purpose of each institution of the UNC

system (at the time, UNC-Chapel Hill, N.C. State University and UNC Greensboro; UNC Charlotte became the fourth member of the system in 1965). In 1972, he reorganized the entire system which had grown to include 16 campuses (now 17 after the addition of the N.C. School of Science and Mathematics).

On more than one occasion, Friday noted his achievements could not have been possible without his wife, Ida. He said, "It took two of us to do this." As "first lady" of the UNC System, Ida Friday was active in community service, including president of the Chapel Hill Preservation Society, member of the board of the North Carolina Symphony Society, chair of the YMCA and YWCA at UNC-Chapel Hill and a member of the League of Women Voters.

Dedicated in 1982, the Friday Building incorporated the best classroom designs for teaching future business leaders for its time. UNC Charlotte faculty and staff, along with the architect, visited a number of institutions recognized for having leading business programs, including Harvard University, the University of Virginia and the University of Tennessee. The Friday Building's classrooms are modeled after the case classrooms pioneered at the Harvard Graduate School of Business.

The 64,000-square-foot building was designed to accommodate a third floor, which was constructed in 1994-95 using \$3 million from a state bond referendum approved by voters in 1993. Changes in the building code required the University to make the facility more earthquake resistant. The columns that grace Friday Building contribute to its distinctive look; they were added during the expansion at the suggestion of Chancellor Emeritus Jim Woodward.

Several other UNC institutions have honored the Fridays with buildings on their campuses, including N.C. State University (the William and Ida Friday Institute for Educational Innovation), UNC-Chapel Hill (the William and Ida Friday Center for Continuing Education) and UNC Wilmington (Friday Hall).

Today, Friday is home to the Belk College of Business and its academic departments and programs.

Gage

The Gage Undergraduate Admissions Center opened for the Fall 2019 semester. The two-story, 18,000-square-foot building welcomes prospective students and their families to campus. Additionally, the Center is home to the Office of Undergraduate Admissions and serves as the starting point for campus tours. This facility was made possible through an estate gift by the late Dr. Lucius G. Gage, Jr.

Dr. Gage was a Charlotte physician and a major benefactor to UNC Charlotte. He passed away in September 2011. He was educated in the Charlotte city schools and entered Duke University for his undergraduate degree after his junior year in high school. He then went on to Duke Medical School where he was recognized for exemplary performance. He completed his residency at the University of Virginia. Gage returned to Charlotte to practice medicine at the Nalle Clinic with his father, the late Dr. Lucius G. Gage, Sr., a founding partner, assuming the Director position in the Allergy and Arthritis Department.

Garinger

Elmer Henry Garinger was one of the visionary leaders who helped Charlotte College realize the dream of becoming a four-year, state-supported institution.

As superintendent of Charlotte City Schools, Garinger employed Bonnie Cone, UNC Charlotte founder, as a mathematics teacher at Central High School. Later, he would name her director of the Charlotte Center of the University of North Carolina, the institution that ultimately became UNC Charlotte.

Born July 13, 1891, in Mount Vernon, Mo., Garinger graduated from the local high school and continued his education at the University of Missouri. He completed a bachelor's degree in 1916, and eventually, he earned a master's degree and doctorate from Columbia University.

During his 40-year career with Charlotte City Schools that began in 1921, Garinger gained a national reputation as a leader in education. In 1949, he was named superintendent of Charlotte City Schools, and he took the lead in planning for the consolidation of the Charlotte and Mecklenburg County school systems, a goal achieved in 1959. Garinger served for a year as superintendent of the new system, retiring as superintendent emeritus.

Garinger's association with UNC Charlotte continued throughout his life. He was instrumental in requesting the Charlotte Center be founded, and he was among the Charlotte leaders who worked to change the Charlotte Center to Charlotte College in 1949. When the institution was placed under the community college system in 1958, Garinger was named secretary of the first Board of Trustees of the Charlotte Community College System; he served in this capacity until 1963, when Charlotte College became a four-year, state-supported institution.

After retiring from the Charlotte-Mecklenburg Schools, Garinger worked to improve public education as a

member of the N.C. House of Representatives, where he served two terms. In honor of Garinger's service to public education and the University, UNC Charlotte's Board of Trustees voted to name the first faculty building, constructed in 1965, in his honor. The Elmer Henry Garinger Building was dedicated in October 1970; a portrait of Garinger that hangs in the building was dedicated in March 1987. He died in Charlotte on August 21, 1982.

The Garinger building is one of the five buildings that make up the original quad of UNC Charlotte. Today, Garinger is home to the Departments of Africana Studies, Philosophy and History.

Grigg

Dedicated on Sept. 8, 2006, William H. Grigg Hall is home to a number of Charlotte Research Institute offices and facilities, including the Center for Optoelectronics and Optical Communications.

Named for the chair emeritus of Duke Energy, Grigg Hall is a 96,820-square-foot, state-of-the-art academic and research facility. In 2002, the Duke Energy Foundation announced a \$10 million gift to the University's capital campaign in support of Charlotte Research Institute programs and initiatives. Construction of Grigg Hall began in 2003 with funding from the state's \$3.1 billion bond referendum approved by North Carolina voters in 2000.

Grigg, who grew up in Albemarle, completed a bachelor's degree from Duke University in 1954. After serving two years in the U.S. Marine Corps, he earned a law degree with distinction from Duke in 1958. After practicing law in Charlotte for five years, Grigg joined Duke Power in 1963 as assistant general counsel. He was promoted to vice president of finance in 1970 and vice president and general counsel in 1971. Elected to Duke Power's board of directors in 1972, Grigg eventually was named vice chair in 1991 and chair and chief executive officer in 1994. He retired in 1997.

During Grigg's tenure with Duke Power, he guided the corporation through some of the most challenging times in the electric utility industry. He helped expand and diversify the company's power plants and led the company's response to competition, including the merger with PanEnergy in 1997 to create Duke Energy. Grigg was named Electric Utility CEO of the Year for 1995 by *Financial World* magazine.

Committed to civic leadership and quality education, Grigg has served countless community groups, including the Charlotte-Mecklenburg Hospital Authority, Foundation for the Carolinas and the Lynwood Foundation. In honor of his contributions to Charlotte and the greater community,

UNC Charlotte awarded Grigg an honorary doctorate of public service in December 1997.

The architectural firm of Perkins-Will, which has offices nationwide, designed Grigg Hall. Constructed for roughly \$24 million, Grigg Hall features a 3,000-square-foot clean room, a controlled environmental space used for research and manufacturing. Clean, contamination-free rooms are used in a variety of research settings – electronics and optics, as well as pharmaceuticals and DVD manufacturing.

Today, Grigg is home to the Department of Physics and Optical Science, Optoelectronics Center, Electrical & Computer Engineering, and Charlotte Research Institute.

Johnson

The Vickie and Gene Johnson Marching Band Center is home to the UNC Charlotte "Pride of Niner Nation" Marching Band.

The 6,700 square foot building houses a conference room, music library and four offices for the band staff. It also includes a storage room for drumline and color guard equipment, as well as ample space to store musical instruments and uniforms for the entire marching band. The band began performing in Fall 2015 with 145 members, but will eventually grow to include 300-350 members.

Johnson Band Center (JBC) was designed by the award-winning architecture firm Watson Tate Savory. The design reflects the architectural characteristics of neighboring Storrs Hall and Robinson Hall, and the building serves as an architectural landmark for patrons going to and from events in the College of Arts + Architecture.

Johnson Band Center is one of a few buildings in the nation dedicated exclusively to a marching band.

Kennedy

The W.A. Kennedy Building was one of the first two facilities on campus. Designed by A. G. Odell Jr., the architect of Ovens Auditorium and Bojangles Coliseum, the building was named for Woodford A. "Woody" Kennedy. Sometimes called the "spiritual father of Charlotte College," Kennedy was a member of the first advisory board of the institution in 1947. He was named to its eight-member board two years later. Without Kennedy's perseverance, Charlotte College likely would have remained a two-year community college.

Kennedy believed that Charlotte deserved and needed a

great university. He stated that a thousand additional high school graduates could go to college each year if the opportunities available in other parts of the state were available in Charlotte. With a zeal he once termed an obsession, Kennedy worked tirelessly to raise money and support to make that happen.

He encountered a lack of support among many of Charlotte's business executives and disinterest from politicians. His rhetoric sometimes became strident, characterizing critics of the project as naysayers and deriding the state's support as a 'sop.'

At the time, the school operated with a part-time faculty who taught in part-time classrooms, and it was financed almost entirely by tuition paid by student loans until Kennedy pushed for and obtained the initial state funding in 1955.

As a member of the college's site selection committee, he searched for a scenic location with room for growth and expansion; the committee ultimately settled on the present location of the UNC Charlotte campus. He told reporters, "I may not but you will live to see 10,000 students at Charlotte College."

The statement proved prophetic. Kennedy died on May 11, 1958, the eve of his installation as a trustee of Charlotte Community College. But his contribution was not forgotten. The trustees proposed that the first building on the new campus be named for him. The building was dedicated on Feb. 16, 1962.

When Kennedy Building first opened, it housed science laboratories (chemistry, physics, biology and geology), as well as labs for a variety of engineering courses. There were 10 classrooms, 12 faculty offices and a lecture room with elevated seating for 100. The building also served as a temporary library; its first floor contained 18,000 volumes while Atkins Library was being built.

Today, Kennedy houses the School of Professional Studies, Center for Teaching and Learning (CTL), and OneIT.

King

Arnold K. King may be one of the few individuals to have a building named in his honor on two UNC system campuses. Ten years before UNC Charlotte dedicated the King Building for him, UNC Wilmington put King's name on an administrative and classroom building. Such an honor is an indication of the vital role King played throughout the UNC system.

From his days as a student at UNC-Chapel Hill in the 1920s

until his retirement as special assistant to UNC President William Friday, King was an integral part in the development of the University of North Carolina system. After receiving his bachelor's degree, he continued his education at the University of Chicago, completing a master's and doctorate. Returning to Chapel Hill, King served as a professor, graduate school administrator, head of summer sessions and vice president. He also was as acting chancellor for UNC Asheville in 1977.

King participated in a number of education-related study commissions, panels and boards across North Carolina and around the country. UNC President Friday and King were colleagues for more than 20 years. The UNC leader turned to King for his assessment when planning for the system's future. King served as a liaison between Friday and Charlotte College during the institution's transition to becoming the University of North Carolina at Charlotte. He later played the same role for UNC Asheville and UNC Wilmington.

In addition to his long service to the UNC system, King was one of the founders of N.C. Wesleyan College, and he was considered an expert on the history of the UNC system. In retirement, he wrote "The Multi-campus University of North Carolina Comes of Age: 1956-1986," a historical bibliography of his three decades working in the system. He finished a 20-page manuscript on UNC's University Day celebration just two days before his death.

The architectural firm of Odell Associates Inc. designed the building, which was constructed by F.N. Thompson Inc. in 1966 at a cost of \$603,000. The King Building was originally named for Addison Hardcastle Reese. It was renamed for King following the dedication of Reese Building, which opened in 1982. Dr. King passed away on March 31, 1992, at the age of 90. A resolution in his memory noted, "Our University lost a part of its memory and conscience, and it lost a great friend."

Today, King is home to the Dean of Students Office, Human Resources, Office of the Registrar, and Student Affairs.

Klein

Klein Hall is a state-of-the-art facility dedicated to advancing scientific research and education. Officially named in 2024, Klein Hall honors the generous \$10 million donation from Gené and Fred Klein, prominent community leaders in Charlotte and loyal supporters of UNC Charlotte. Fred has provided valuable leadership to the University by serving on the Board of Trustees and the Foundation Board, as well as providing key funding for the Childress Klein Center for Real Estate and serving on the

Childress Klein Center Advisory Board. As a founding partner of Childress Klein, one of Charlotte's most respected private real estate firms, Fred has helped shape the skyline of our city and developed many of Charlotte's most prominent landmarks. In 2024, Fred was honored with the UNC Charlotte Distinguished Service Award, reserved for civic and community leaders who have been essential to the Charlotte region and the University's growth. The Kleins have a deeply rooted interest and passion for science and mathematics. Gené spent her early career as a math educator, and Fred received his undergraduate degree in engineering. Together, they have championed the importance of science and math education in fostering critical thinking and problem-solving skills that are valuable to all students, regardless of their professional pursuits.

Klein Hall is a modern marvel, featuring 130,000 square feet of open areas, classrooms, and teaching and research laboratories spread across three stories plus a basement, with a central café and attached regional utility plant that serve the overall campus and student body. Designed by Clark Nexsen and Payette and constructed by Balfour Beatty, Klein Hall opened its doors in 2022 at a cost of over \$80 million. This facility is equipped with cutting-edge laboratories, collaborative spaces, and advanced technological resources, making it a hub for innovative education and scientific discovery. The main lobby also contains a dramatic two-story 3D science and mathematics feature wall designed by architectural firm Jenkins Peer with input from faculty and students.

Overall, Klein Hall and Klein College of Science represent a significant advancement for UNC Charlotte. They embody the university's commitment to scientific excellence and innovation, providing students and faculty with the resources and environment needed to thrive in their academic and research endeavors. The generosity of Gené and Fred Klein has not only transformed the physical landscape of the campus but also set the stage for future scientific breakthroughs and educational advancements.

Klein Hall houses the College of Science.

Macy

The Macy Building was one of the first two facilities constructed on the UNC Charlotte campus. It was named for Pierre Macy, professor of French and chair of the-then Foreign Language Department. The 18,000-square-foot research and instructional facility was constructed concurrently with the Kennedy Building by Odell Associates in 1961 at a cost of \$418,000.

Macy was born in France in 1899 and received degrees from the University of Nancy, the University of Dijon, and the University of Paris before making the United States his adopted home.

The noted author and translator arrived at Charlotte College in 1949 and almost single-handedly established and maintained the fledgling college's Foreign Language Department (now the Department of Languages, Cultures, and Translation). Before joining the faculty of Charlotte College, Macy was chair of the Romance Language departments at Kentucky Wesleyan College, the University of Tulsa and the College of William and Mary. He returned to his alma mater, the University of Nancy, for one year as a visiting professor.

An integral faculty member of the college, Macy served on the curriculum committee, chaired the concerts and lectures committee, advised the French Club and later served on the University's executive committee.

Students held Macy in such high regard that the 10th edition of the yearbook was dedicated to him in 1960 "for his deep understanding, patient guidance and personal interest in the students of Charlotte College. He has inspired us to greater achievements through his teaching and counseling, and he will be fondly remembered in our memories of Charlotte College."

Macy served as the first commencement marshal for the newly established University. His dedication to UNC Charlotte went well beyond any specific position he held. He taught French three years after relinquishing the department chairmanship and stayed on the faculty two years after he reached retirement age.

At his 1969 retirement, he received the rare honor of being named a faculty emeritus from his colleagues. "The Foreign Language Department, carefully constructed by Dr. Macy over the years, was clearly one of the solid blocks of the foundation of the new institution," read the tribute. He is further remembered today with the Pierre Macy Award for Excellence in French.

The Macy building is one of the five buildings that make up the original quad of UNC Charlotte. Today, Macy is home to the Department of Global Studies and Department of Religious Studies, Art & Art History, and the College of Arts & Architecture.

McEniry

Built to house the University's earth and life sciences programs, the McEniry Building is named for UNC Charlotte's first vice chancellor for academic affairs, William Hugh McEniry. The \$4 million, 103,000-square-foot

facility was completed July 7, 1975, to house the Departments of Earth, Environmental, and Geographical Sciences and Biology.

Chancellor Dean Colvard hired McEniry (pronounced My-Canary) in 1967; Colvard was searching for a top-notch administrator with an arts and sciences background. Based upon numerous recommendations, Colvard recruited McEniry away from Stetson University where he had spent 27 years and served as a university dean. Ready for a new challenge, McEniry and his wife, Mary, relocated to North Carolina and settled into a 17-acre plot of land between the University and Huntersville they dubbed "Rural Simplicity."

McEniry is credited with recruiting dedicated and talented faculty to UNC Charlotte, and he was active in a number of organizations, such as the North Carolina Association of Colleges and Universities and the College Entrance Board. He also served as president of the Southern Association of Colleges and Schools.

Dedicated to improving higher education for blacks, McEniry served as a trustee of Johnson C. Smith University. In addition, he personally financed scholarships for some black students and worked with the Ford Foundation to improve academics and the curricula for historically black colleges.

In 1973, McEniry agreed to serve as acting chancellor at Western Carolina University in Cullowhee until a permanent chancellor was hired. He passed away on March 15, 1974, at the age of 57.

The McEniry Building is just one lasting tribute to the University's pioneering vice chancellor. Each year, a member of the graduating class with the highest GPA receives the W. Hugh McEniry Award for Academic Excellence. The North Carolina Association of Colleges and Universities named its top honor for the trailblazing educator - the Hugh McEniry Award for Outstanding Service to North Carolina Higher Education. Following McEniry's death, Stetson University established the McEniry Award, a prestigious honor given a professor as selected by faculty members and students.

Today, McEniry is still home to the Department of Earth, Environmental, and Geographical Sciences.

Memorial Hall

Memorial Hall is dedicated to fallen U.S. veterans. The building houses the Departments of Military Science (Army ROTC) and Aerospace Studies (Air Force ROTC). It serves as a memorial to commemorate UNC Charlotte students who have served in any branch of the Armed Services

and lost their lives in service to the country.

PORTAL

The Partnership, Outreach, and Research to Accelerate Learning (PORTAL) building, which opened in February 2014, demonstrates UNC Charlotte's commitment to foster partnerships with private industry. Designed to stimulate business growth and job creation along with promoting research and innovation and supporting the entrepreneurial ecosystem of the Charlotte region, PORTAL is a venue where entrepreneurs can collaborate with peers, faculty members, and students to harness the power of a research university to plan strategies that lead to business success.

PORTAL is outfitted with over 90,000 square feet of floor space dedicated to business innovation and partnership with front door access to the exceptional resources, facilities, and academic talent found on the UNC Charlotte campus. The building has a contemporary aesthetic and 4-story atrium bound by office suites, meeting rooms, and a café. Business tenant offices and suites start at about 200 square feet and are expandable as required. An abundance of naturally lit community gathering spaces – including glass enclosed meeting rooms located on two atrium transecting bridges – facilitate networking and idea exchange. Business tenants have access to any of PORTAL's four meeting rooms on a scheduled basis.

Reese

Around Charlotte, Addison Hardcastle Reese is probably better known as a titan of the banking industry rather than for his passionate commitment to UNC Charlotte.

Born in Baltimore County, Md., on Dec. 28, 1908, Reese attended Johns Hopkins University but left after his junior year to begin his lifelong career in banking. He worked as a clerk, a senior national bank examiner and a bank vice president all before serving in the U.S. Air Force during World War II.

Reese returned to banking after the war and was recruited to Charlotte in 1951 as executive vice president of American Trust Company. He was promoted to president in 1954 and organized a series of mergers that became the North Carolina National Bank, which has since evolved into the Bank of America. He also served on the board of the Federal Reserve and as a director of the International Monetary Conference.

Named to the Board of Advisors of the Charlotte Community College System in 1957, Reese was later elected to the college's Board of Trustees. He chaired the Charlotte College Site Committee and worked with

University founder Bonnie Cone and Pete McKnight to choose UNC Charlotte's current location.

In 1963, Reese was appointed vice chair of the Charlotte College Board of Trustees and took over as chair following the death of J. Murrey Atkins. He spent a year as a member of the North Carolina Legislative Study Commission on Student Financial Aid and was a member of the UNC Charlotte Foundation.

In 1968, UNC Charlotte awarded its first honorary degrees. One went to Reese and the other went to Frank Porter Graham, former University of North Carolina president, U.S. senator and United Nations mediator.

Reese's award recognized him as "a man of vision, who foresaw a university of excellence, where those of lesser vision saw only a struggling community college."

The North Carolina Citizens Committee presented Reese with the 1974 Distinguished Citizenship Award. Reese also served on the boards of trustees for both the University of North Carolina and UNC Charlotte, serving as the chair of the latter from 1972 until his death in 1977.

Like the Colvard Building, the Reese Administration Building was designed by Harry Wolf of Wolf Associates. It was completed in 1982, and is named in Reese's honor.

Today, Reese houses the office of the Vice Chancellor for Business Affairs, Financial Services, the Office of Financial Aid, and the Graduate School.

Robinson

Robinson Hall for the Performing Arts is a state-of-the-art venue that affords the campus and the community access to a slate of contemporary and classical dance, music and theater offerings.

Named for Russell and Sally Dalton Robinson, the three-story, 118,000-square-foot facility contains classrooms, offices and performance and rehearsal spaces for the departments of dance, music and theatre. It was built and equipped for \$28 million, financed through the statewide bond referendum approved by voters in 2000.

The hall's first floor houses a 332-seat proscenium theater, which includes a 23-seat orchestra pit. The theatre has a 3,500-square-foot stage equipped with 18 trapdoors, a curtain 26 feet high and a 60-foot fly-loft for storing and changing scenery. There also is the Black Box Theatre. Throughout the building are rehearsal rooms and labs for costume, scenery and lighting design.

The Robinsons are both Charlotte natives, and they are

considered among the most admired and effective community leaders. In addition to leadership roles at Christ Episcopal Church, they have supported professional, educational and charitable institutions, arts and cultural organizations and economic development services.

Russell Robinson II is founding partner of one of North Carolina's largest law firms - Robinson, Bradshaw and Hinson. According to an article in the Charlotte Observer, Robinson majored in English at Princeton University but transferred to Duke University after two years. He went on to obtain his law degree from Duke in 1956. His firm has represented numerous businesses and organizations, including Belk Store Services Inc., the Duke Endowment, Duke Power and the Charlotte Housing Authority. His book "Robinson on North Carolina Corporation Law" is considered a necessity for any aspiring Tar Heel corporate lawyer.

A member of the UNC Charlotte Board of Trustees from 1987-97, Robinson served as chair for eight years. During his board tenure, Robinson was regarded by observers as a "quiet power" for the University; he focused on increasing public and private funding and obtaining UNC system authorization for doctoral degrees beyond joint Ph.D. programs.

In addition to his role as a trustee, Robinson was a director of the UNC Charlotte Foundation. He also has been a trustee of the Duke Endowment and chair of Duke University's Board of Trustees.

Sally Dalton Robinson attended public schools in Charlotte, St. Mary's School in Raleigh and Duke University. She was a member of Phi Beta Kappa and earned a bachelor's degree in history. Among her many civic contributions, she served as an integral founding member of the Levine Museum of the New South and the St. Francis Jobs Program (now the BRIDGE Jobs Program). She also was on the board of the Charlotte Symphony, the Arts and Science Council, McColl Center for the Visual Arts as well as other religious, charitable and economic organizations.

Dedicated November 3, 2004, Robinson Hall was designed by the Charlotte architectural firm of Jenkins Peer. Skanska and R.J. Leeper were general contractors, while the firm Biemann and Rowell was the mechanical contractor. Port City Electric served as the electrical contractor; the hall's lighting and acoustical controls were among the most sophisticated in modern theater design at the time of construction.

Today, Robinson Hall is home to the Departments of Dance, Music, and Theatre; the Anne R. Belk Theater; and the Lab Theater.

Rowe

The Oliver Reagan Rowe Arts Building honors one of UNC Charlotte's founding fathers. Completed in 1971, the 75,000 square-foot facility was constructed to house the then departments of Performing and Visual Arts. The building's focal point is an eight-sided theatre that seats 350. It also includes a recital hall, classrooms, offices, practice rooms and a large lobby-gallery.

Rowe was born Dec. 12, 1902, in Newport, Tenn. He and his wife Maria would become avid supporters of the Charlotte arts community and UNC Charlotte. Rowe's family moved to Charlotte when he was a child. After graduating from Central High School, Rowe attended UNC-Chapel Hill, where he completed a bachelor's degree in electrical engineering. He returned to Charlotte and began work with the R.H. Bouligny engineering firm. He eventually became president of R.H. Bouligny Inc., Powell Manufacturing Co. and Powell Agri-Systems Ltd.

In the 1950s, Rowe supported consolidation of city and county schools, which won him the Charlotte News "Man of the Year Award" in 1958. That same year, Gov. Luther Hodges appointed Rowe to the first Board of Trustees for the Charlotte Community College System. He chaired the board's finance committee, and he was instrumental in soliciting the largest single gift to the-then Charlotte College Foundation (now the Foundation of the University of North Carolina at Charlotte).

Between 1961 and 1963, Rowe made numerous speeches championing the cause of higher education for the Charlotte region. In 1964, the Charlotte Civitan Club presented its Distinguished Citizenship Award in recognition of Rowe's efforts on behalf of the University.

During the rest of the 1960s, Rowe continued to find new causes for his leadership. A long-time music lover, Rowe began to support the opera and symphony. Eventually, he was elected president of the Charlotte Symphony Orchestra Society, and in 1973, he established, nurtured and financially supported the "Rowe String Quartet" at UNC Charlotte.

In 1987, Rowe was awarded an honorary Doctor of Human Letters. The citation reads in part that "Oliver Reagan Rowe Sr. was a founding father of the University of North Carolina at Charlotte. He helped to dream the dream and to make it come true ... With his vision, he painted a picture of a major state university when others around him saw only the two-year college then existing."

Today, the Rowe Building is home to the Department of Art and Art History.

Smith

The Sheldon Phelps Smith Building honors an individual whose foresight helped to chart UNC Charlotte's educational course.

Smith, vice president and general manager of the Douglas Aircraft Company's Charlotte Division, served as a trustee of Charlotte College from 1958 to 1965. He is credited with bringing an engineering program to the institution. Through his generosity, Douglas Aircraft Co. engineers taught at Charlotte College on a released time basis; as many as nine part-time instructors from Douglas were in service at one time.

Born in Redlands, Calif., on March 26, 1910, Smith graduated from Pomona College in 1932 with a bachelor's degree in physics. During World War II, he served as a lieutenant with the Engineering Division of the Navy Bureau of Aeronautics and was assigned to the missiles branch. Following the war, he was a missile project engineer with the Douglas Aircraft Co. Prior to moving to Charlotte, he was an assistant design engineer for missiles at the company's Santa Monica facility.

In addition to starting the University's engineering program, Smith is credited with bringing graduate courses in mathematics and physics to the-then Charlotte College through a cooperative agreement with N.C. State University.

As an advocate for the college, Smith once said, "If we marry the manpower development of this Charlotte College area of some 1 million people to the tremendous demand of technical industries for engineers and scientists, we will accomplish two ends: to help satisfy the great national requirements for engineers and scientists and to improve the usefulness and economic standards of the residents of North Carolina."

Smith left Charlotte to become vice president of Douglas Aircraft and vice president of Douglas United Nuclear Corp. in Hanford, Wash. He died April 28, 1966.

The Smith Building, completed in 1966, was originally called the Engineering Building. The 71,000 square-foot, \$1.6 million facility was the largest classroom and laboratory building on the campus at the time. When finished, it housed the Computer Center, Mathematics Department, the Geography and Geology Department (now Department of Earth, Environmental, and Geographical Sciences) and the Engineering Program.

UNC Charlotte dedicated the building in honor of Smith on Dec. 15, 1968, in a ceremony held in the Cone University

Center. The Smith family presented a portrait of the building's namesake to be placed in the facility.

Today, Smith is home to the College of Engineering's Office of Student Development and Success, Mosaic Lab, and the Department of Engineering Technology and Construction Management.

Storrs

The Thomas I. Storrs Building resulted from the collaboration between Charlotte architectural firm Ferebee, Walters and Associates and New York architects Charles Gwaltmey and Robert Siegel.

Since its completion in 1990, Storrs Building has been used as an "architectural education instrument," because students and professionals can study its many unique features, as the building is considered a virtual textbook for use of materials and systems. This 87,000-square-foot facility features a complex roof design, natural and artificial lighting systems, double helix stairs and exposure of structural and environmental systems. Home to the School of Architecture in the College of Arts and Architecture, Storrs Building is appropriately named for an individual who dedicated himself to helping build the University.

Storrs, born in 1918, dropped out of high school during the Great Depression. At the age of 15, he began work as a clerk at the Federal Reserve Bank of Richmond, Va. He would later resume his formal education, enrolling in the University of Virginia, where he completed undergraduate studies. He earned a master's degree and doctorate in economics from Harvard University.

Originally from Nashville, Tennessee, Storrs joined the-then North Carolina National Bank (NCNB) in 1960 as executive vice president. He would later serve as one of the architects who laid the foundation for NCNB to emerge as NationsBank (now Bank of America). Following the retirement of Addison Reese, Storrs became chair and CEO, and he would follow his predecessor's example as a member of the UNC Charlotte Board of Trustees for nearly 12 years – the last four years as chair. His civic involvement included serving as president of the Business Foundation of North Carolina, vice president of the North Carolina Engineering Foundation and director of the North Carolina Textile Foundation. In 1990, he was inducted in the North Carolina Business Hall of Fame.

A recipient of the UNC Charlotte Distinguished Service Award, Storrs also has a scholarship in his name at the University of Virginia.

Formal groundbreaking for the \$7.5 million Storrs Building was held Aug. 26, 1988. Dedication of the building was

Oct. 29, 1990, and a ceremony to name the facility in honor of Storrs was held Sept. 16, 1992.

Today, the Storrs Building is home to the College of Arts + Architecture and School of Architecture.

Winningham

If one person can be credited for launching the tradition of bringing prominent speakers to the UNC Charlotte campus, then it is Edyth Farnham Winningham, one of the University's pioneering faculty members.

Winningham, born Jan. 26, 1900, in Arthur, N.D., earned a bachelor's degree in modern languages from the University of North Dakota. She later earned a master's in political science from UNC-Chapel Hill, reportedly the first woman in the state to complete the degree.

Beyond teaching high school in North Dakota and North Carolina, Winningham served as a faculty member at the University of Wyoming, the Women's College of the University of North Carolina (now UNC Greensboro) and the UNC College Center in Wilmington (now UNC Wilmington). Her connection to UNC Charlotte dates back to its time as Charlotte College. Winningham joined the faculty in 1947, and she spent the next two decades infecting everyone around her with her passion for politics and international affairs.

Winningham frequently stated that one of her dreams was to bring prominent thought-leaders to the campus to "open up windows" for the institution's students. Her persistence paid off in 1966 with the establishment of the University Forum Council, which sponsored an event each year to bring noted speakers to the campus to address crucial issues facing contemporary society. She chaired the council until spring 1971, despite retiring in 1967 as professor emeritus. According to Special Collections, the final forum was held March 2, 1995. This 30th annual event focused on "Violence: Is Prevention the Key?"

Even after retiring, Winningham continued to lecture on world affairs and international education. She and her husband also established the James and Edyth F. Winningham Scholarship for undergraduate political science majors.

In 1970, Winningham's service to the greater Charlotte community was recognized by the League of Women of Voters. The organization singled her out for her instrumental role in forming closer ties between the University and the Charlotte community at large, and she was named WBT Radio's Woman of the Year. In 1985, UNC Charlotte awarded her an honorary Doctor of Humane Letters. She died May 27, 1994.

The 10,507-square-foot classroom building which bears her name was constructed in 1965 by F.N. Thompson Inc.; the architectural firm Odell Associates designed the facility.

The Winningham building is one of the five buildings that make up the original quad of UNC Charlotte. Today, Winningham is home to the Department of Art & Art History, and Philosophy.

Woodward

As students at UNC Charlotte attend classes in the science and technology building on campus, they are walking into the physical manifestation of the work done by Chancellor Emeritus James Woodward and his wife Martha. On November 16, 2005, the building was formally dedicated to recognize the Woodwards' 16 years of service and devotion to the University.

The James H. and Martha H. Woodward Hall is a direct result of their vision to help elevate UNC Charlotte to a research institution. The Woodwards worked together to raise awareness of the University's vital role as an economic engine and build many new partnerships and friendships for the institution. As Chancellor from 1989 to 2005, Jim Woodward was the visionary, strategist, and master builder who guided UNC Charlotte's development as a major research institution. Martha played a vital role in strengthening ties to UNC Charlotte through the hosting of thousands of guests regionally and nationally. Throughout their 16 years at the University, the Woodwards worked together to bring much needed attention to both the University's strengths and to its resource needs.

Today, Woodward Hall is home to the College of Computing and Informatics; and Departments of Biological Sciences, Computer Science, Mechanical Engineering & Engineering Science, and Software & Information Systems.

UNIVERSITY LOGO



discover the unknown, and the promise to build the future.

In 2021, UNC Charlotte adopted the All-in-C logo, which features a block-style letter C with a pickaxe (used by Charlotte mascot Norm the Niner). The design pays tribute to the University's trailblazing spirit. The All-in-C represents the power to break new ground, the persistence to

UNIVERSITY SEAL

UNC Charlotte became the fourth campus of the University of North Carolina in July of 1965. In the fall of 1965, the new UNC Charlotte seal was chosen by a committee of students (the three upper-class presidents), three faculty members, and the school publicity director, who served as chair. Final approval was given by Acting Chancellor Bonnie Cone.

UNC Charlotte seal's elements are: the modern arches (the tulip design from the canopy of the Kennedy Building) at the top to symbolize that this is a twentieth century university; two Cs in the middle to represent Charlotte College, from which the new campus sprang; and the pine cone at the bottom for the Old North State [land of the longleaf pine]. The date on the seal is 1946, the year in which the institution began as the Charlotte Center of the University of North Carolina.



ALMA MATER

UNC Charlotte's Alma Mater has deep roots in the institution's history. It was part of an "Academic Festival March" composed for UNC Charlotte by James Helme Sutcliffe, a Charlotte composer and music critic who lived in Germany at the time. Dr. Loy Witherspoon, professor of religious studies, commissioned the March in 1965 when he learned that Charlotte College would become a campus of The University of North Carolina. The March was first performed in 1967 at the installation of Dean W. Colvard as UNC Charlotte's first chancellor. Afterwards, it was performed as a recessional at every Commencement during Dean W. Colvard's tenure as chancellor. When UNC Charlotte founder Bonnie Cone heard the March, she said, "I can hear an alma mater in it," referring to a hymn-like refrain. Dr. Robert Rieke, a professor of history, also heard an alma mater in it.

On a 1990 trip to Germany, Rieke visited Sutcliffe, picked up a recording of the March, and began writing words to fit the final refrain. On Christmas Eve 1991, he sent Bonnie Cone the words and music as a Christmas present to her and to the University, from which he had retired a year earlier. Chancellor James H. Woodward approved the composition as the University's Alma Mater in April 1992. It was sung for the first time at the following May

Commencement and has been performed at every Commencement since.

THE 49ERS

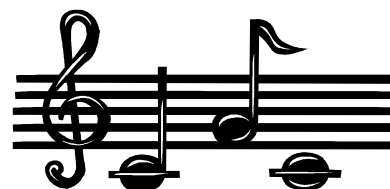
The nickname, the 49ers, was chosen in recognition of the importance of the year 1949 in the history of the University. UNC Charlotte, which began as an off-campus center of the University of North Carolina at Chapel Hill, would have closed its doors in 1949 had Bonnie Cone and her supporters not convinced the N.C. Legislature that Charlotte needed a permanent college. Charlotte College was established that year. Additionally, the campus is located on N.C. Highway 49, and Charlotte has a rich gold mining history -- the term "49ers" symbolizes gold mining. A bronze statue of the 49ers Gold Miner sits at the bottom of the staircase between the College of Education and College of Health and Human Services buildings on campus. The statue recalls the region's history as a gold mining center and symbolizes the pioneering spirit and determination that has led to UNC Charlotte's dramatic growth.

49ERS FIGHT SONG

The fight song music was composed by former music faculty member Dr. Harry Bulow in 2001. It replaced one which belonged to the University of Texas at Austin, entitled "Texas Fight," which had been used since the late 1960's. The new fight song was played for five years before Dr. Laurence Marks, UNC Charlotte's director of bands, composed a set of lyrics in 2006. Minor changes suggested by the campus administration, Athletics, and students were accepted by Marks and submitted for final approval by the Chancellor and the 49ers Fight Song, reflected below, was born.

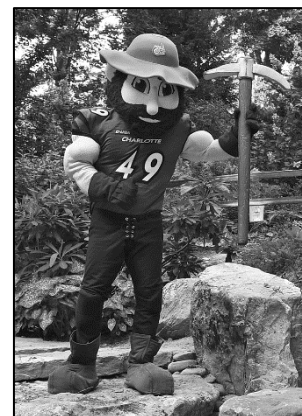
*Hail, Charlotte 49ers, proud as we can be
We stand to fight for the green and white
'Til we win the Victory (Go Niners!)*

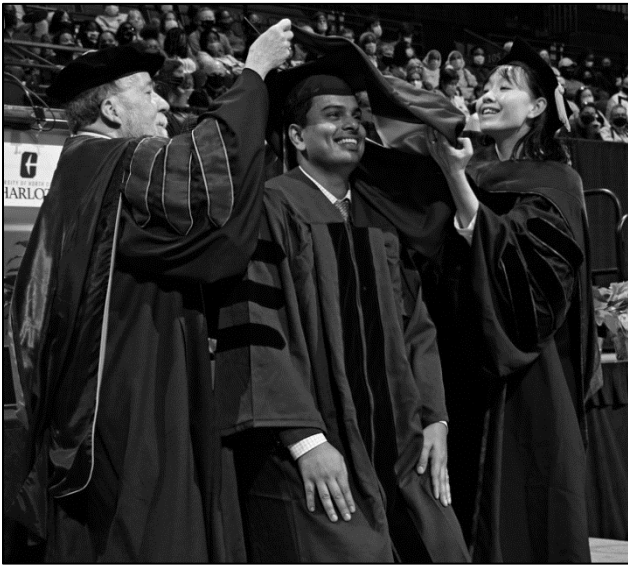
*We pledge our trust in you,
And wave your colors high
The loyal Niner Nation cheers,
Forever! We'll Fight-Fight-Fight!*



MASCOT

A miner was chosen as the UNC Charlotte mascot as a nod to Reed Gold Mine in nearby Concord, the site of the first documented gold find in the United States in 1799. He was named Norm through popular student vote shortly after he was made mascot. Norm is rarely seen without his trusty pick-axe and never takes his slouch hat off.





The Graduate School

graduateschool.charlotte.edu
gradadmissions.charlotte.edu

The University of North Carolina at Charlotte was established in 1965 by the North Carolina General Assembly, which transformed Charlotte College, with beginnings in 1946, into a campus of The University of North Carolina. The Graduate School was established in 1985 with the appointment of the first Dean of the Graduate School, although graduate degree programs had been offered since 1969. Today, more than 800 members of the Graduate Faculty and over 6,200 graduate students participate in a broad array of graduate programs at the master's and doctoral levels and in graduate certificate programs.

The executive and administrative affairs of the Graduate School are carried out by the Associate Provost for Graduate Programs and Dean of the Graduate School, who acts in cooperation with the deans of the eight disciplinary colleges of Arts + Architecture, Business, Computing and Informatics, Education, Engineering, Health and Human Services, Humanities & Earth and Social Sciences, and Science.

Graduate Student Core Competencies

Unlike undergraduate education, graduate education is intended to develop independent, specialized skills and knowledge in a particular academic discipline. Graduate students completing a master's or doctoral degree should be able to claim competency in a range of skills, in addition to expertise in their academic discipline. The Graduate School has identified the following "core competencies" which graduate students should strive to develop. The ways in which these competencies are taught or interpreted will vary by program and will reflect

the expectations of the specific degree program in which the student is enrolled. In addition, the Center for Graduate Life & Learning (CGLL) offers a variety of programs aligned with each competency.

- **Communication (Oral and Written):** Graduate students and postdocs at UNC Charlotte will develop the communication skills needed in order to write and speak effectively and persuasively using a variety of media. This includes preparing scholarly and peer reviewed publications, grant writing, public speaking, facilitating group discussions for various audiences, communicating effectively in the workplace, and increasing positive interpersonal relationships through communication.
- **Leadership:** Leadership skills are invaluable in academia and beyond. UNC Charlotte students and postdocs will have wide-ranging opportunities to develop the leadership competencies necessary to motivate, inspire, and manage others. The CGLL and the Graduate School will promote the development of ethical, competent leaders, ensuring success in a variety of contexts. Mentorship, effective decision-making, problem solving, and management skills will be cultivated through graduate studies at UNC Charlotte.
- **Knowledge Development and Application:** Graduate students and postdocs will develop the critical thinking skills necessary to teach effectively in all types of environments: academic, corporate, or otherwise. They will possess an understanding of the challenges presented in non-traditional and inclusive settings, and they will master the skills needed to create dynamic learning in any environment. UNC Charlotte graduate

teaching assistants will become competent with the most current instructional methods and technologies, enabling them to stimulate critical, innovative learning in others.

- **Ethics and Scholarly Inquiry:** Graduate Students and postdocs at UNC Charlotte will develop the necessary scholarship skills for success in their chosen discipline, while maintaining a fierce commitment to ethical practices, both personally and professionally. These skills will reflect the commitment to diverse ideas, academic collegiality, and to continued student learning--concepts inherent to an interdisciplinary environment. Graduate students and postdocs at UNC Charlotte will be committed to lifelong learning and remain active in the search for knowledge.

Graduate Council

The Graduate Council, whose voting members are elected by the Graduate Faculty, reviews, develops, and makes recommendations concerning Graduate School policy. All curricular proposals and all criteria for membership on the Graduate Faculty come before the Graduate Council. In addition, the Graduate Council serves in an advisory capacity to the Dean of the Graduate School.

Graduate Faculty

In accordance with criteria developed by each graduate program or unit and approved by the Graduate Council, the Dean of the Graduate School appoints members of the Graduate Faculty for renewable terms. Members of the Graduate Faculty offer courses and seminars, mentor graduate students, and supervise research at an advanced level of scholarship.

Graduate Program Directors

Each graduate program, and in some cases certain program areas within a discipline, has a Graduate Program Director. This individual is a member of the Graduate Faculty and is responsible for coordinating and managing various functions of the graduate program, including recruitment, admissions, funding, enrollment, and retention to graduation. Directors, along with a student's advisor, assist students with understanding program requirements and can answer program specific questions such as transfer credit, prerequisites, program specific admission requirements, etc.

TYPES OF GRADUATE PROGRAMS

This section generally describes types of degrees and programs. See the "Academic Programs" section of this *Catalog* for a list of specific available graduate programs.

Doctoral and Master's Degree Programs

UNC Charlotte offers 25 doctoral and 64 master's degree programs. To be admitted to a degree program, an applicant must meet all the requirements for admission, be recommended for admission by the program in which they propose to study, and receive final approval for admission by the Graduate School. Acceptance into one graduate program does not guarantee acceptance into another one.

Graduate Certificate Programs

UNC Charlotte offers 57 graduate certificate programs and 7 post-master's certificate programs. Graduate certificate programs (including post-master's certificate programs) are designed for students who wish to complete a coherent program in a defined area to enhance their professional skills and/or academic knowledge.

Students are admitted to a specific graduate certificate program and advised by faculty in the unit offering the graduate certificate. Many of UNC Charlotte's graduate certificate programs are comprised of the courses in a master's degree. Since the graduate certificate is not a degree, students may apply the credits earned in the certificate program toward a single (master's or doctoral) degree that they pursue either concomitant with pursuing a graduate certificate or after the certificate has been awarded. *[Please note: time to degree limits do apply.]*

Post-Baccalaureate (Non-Degree) Program

Applicants seeking to take courses beyond the baccalaureate degree for license renewal, for transfer to another institution, as prerequisites for admission to a graduate degree program, or for personal satisfaction may be admitted as post-baccalaureate/non-degree students. The number of transfer credits that may apply to a degree program can vary. Post-baccalaureate students must apply for admission each semester. See "Registration, Transfer Credit" under the Degree Requirements and Academic Policies section of this *Catalog* for details.

Readmission – All Students

Graduate certificate and degree-seeking students whose enrollment is interrupted will remain eligible to register for one semester without having to reapply for admission to the University if they are in good standing and have not

exceeded the five-, seven-, or nine-year limit for their academic program of study. After an absence of more than two consecutive academic semesters (Fall, Spring), the student's record will be closed and the student must apply for readmission; acceptance is subject to program and Graduate School approval. Students whose enrollment is suspended or terminated for academic reasons should consult the description of the procedures outlined in the "Academic Standing" section of the *Catalog*. Students whose enrollment is suspended or terminated for disciplinary reasons must have their readmission materials reviewed by the Campus Safety Review Committee; see the UNC Charlotte Code of Student Responsibility within this *Catalog*.

Accelerated Master's Programs

See "Types of Admission" under the Admission to the Graduate School section of this *Catalog* for details.

Dual Undergraduate and Graduate Registration

See "Types of Admission" under the Admission to the Graduate School section of this *Catalog* for details.

Early Entry to Graduate Programs

See "Types of Admission" under the Admission to the Graduate School section of this *Catalog* for details.

GRADUATE STUDENT LIFE

Thomas L. Reynolds Center for Graduate Life & Learning (CGLL)

The Graduate School is committed to providing graduate students at UNC Charlotte with the highest caliber of graduate education. While academic instruction and scholarly research are the ultimate foundation of any graduate education, the Graduate School also recognizes the importance of providing students with the resources and services needed to develop themselves professionally. The Graduate School's Thomas L. Reynolds Center for Graduate Life and Learning (CGLL), named after Dean Emeritus Dr. Tom Reynolds who served as associate provost of graduate programs and dean of the Graduate School from 2002 to 2023, supports the success of all graduate students. Located in Atkins Library Annex, the CGLL offers space for community building and interdisciplinary exchange. The center offers professional development in the form of credit-bearing courses and workshops to build core competencies among students in communication, leadership, teaching, cultural engagement, and ethics and scholarly inquiry.

Graduate & Postdoctoral Writing Center

The Center for Graduate Life & Learning supports the writing efforts of master's students and doctoral students who are actively writing their dissertations. The CGLL's Assistant Teaching Professor of Writing offers one-on-one coaching sessions to help dissertation students improve their academic writing skills, understand the dissertation process, work more effectively with their chairs and committee members, manage their time, set realistic writing goals, and deal with barriers to writing. Graduate students are encouraged to participate in structured communal writing time held regularly and in Graduate Writing Retreats offered several times each academic year.

Graduate Life Fellows

Each year, the Center for Graduate Life & Learning appoints a group of master's and doctoral-level students from across degree disciplines to serve as Graduate Life Fellows (GLFs). GLFs enjoy the opportunity to gain important leadership and communication skills while having a meaningful impact on the graduate student experience. For more information on the GLF program, visit the Thomas L. Reynolds Center for Graduate Life & Learning, gradlife.charlotte.edu/about-us/graduate-life-fellows.

New Graduate Student Orientation

The Graduate School conducts University-wide orientation programs for new graduate and post-baccalaureate students at the start of each Fall, Spring, and Summer semester. Information about the dates and times of these programs can be found online at gradlife.charlotte.edu/graduate-community/orientation. Information is also sent directly to newly enrolled students at the time of matriculation, along with the link to the Graduate School's New Graduate Student Onboarding Portal at sites.google.com/uncc.edu/uncc-grad-student-portal/home.

The New Graduate Student Onboarding Portal is a curated guide that offers a snapshot of vital information new graduate students need from the time they enroll through their first year. In addition to providing the basics that students need to get started, the site highlights information about various University programs and services for graduate students, important policies and procedures, and resources available to support graduate students academically and socially.

Many individual graduate programs conduct discipline-specific orientation programs for their new graduate students. Degree students should contact their program directors or coordinators for information on programs that may be available. In addition, the International Student/Scholar Office (ISSO) conducts orientation sessions specifically designed for international graduate students.

Graduate Teaching Assistant Training

In an effort to ensure all Graduate Teaching Assistants (GTA) have the necessary information and policies needed to be successful in their teaching role, the Thomas L. Reynolds Center for Graduate Life & Learning (CGLL) requires each new GTA to complete online training prior to the start of their assistantship. This training, available in Canvas, includes modules on FERPA, Discrimination/ADA, Common First Amendment Issues, Title IX, Classroom Management, The Art of the Rubric, and more. The online training is required by UNC Charlotte, in addition to any TA Training offered at the department level. More information can be found online at gradlife.charlotte.edu/professional-development/teaching-skills.

Graduate Teaching Assistants (GTAs) who are classified as “international” and who speak English as an additional language to their first language(s) are assessed for English language proficiency specific to college classroom settings before teaching. This requirement is mandated by the UNC System. Neither length of time spent in the U.S. nor prior attendance or employment at a U.S. institution exempt International Teaching Assistants (ITAs) from this requirement.

Assessments are offered twice a year during the fall and spring semesters. While information is sent out to the departments and to the ITAs ahead of time, it is the responsibility of each ITA to sign up for an assessment. ITAs who pass the assessment may begin their instructional duties, while ITAs who are borderline may be able to teach at the discretion of their home departments. ITAs who do not pass the assessment must enroll in the 10-week Communication Course before reattempting the language assessment. This non-credit course is free to the ITAs.

Student Involvement

Students at UNC Charlotte are encouraged to participate in co-curricular activities. UNC Charlotte acknowledges that graduate students have many, many priorities in their lives. However, as with so many other aspects of one’s life, active involvement enhances the experience, promotes well-being, and helps individuals develop skills needed for professional success.

Graduate students are encouraged to participate in student leadership at some point during their academic career. In particular, graduate students may hone skills that will be useful in a variety of academic and industry professions. An active student body contributes to the vibrant community of graduate students and scholars at UNC Charlotte, making graduate education more relevant to students across disciplines.

Graduate and Professional Student Government

The Graduate and Professional Student Government (GPSG) is the governing and primary organization for graduate students to present their needs to the University. The purpose of the Graduate and Professional Student Government (GPSG), according to the by-laws, is to serve as an appropriate voice on campus for graduate students, to meet the various needs of graduate students, and to establish a liaison between graduate faculty, graduate students, and the University. All graduate students are members of the GPSG.

In the spring of 1998, the Graduate Student Association successfully petitioned the student body through a referendum on the spring student body elections. The results of this referendum provided a significant change in the student body constitution and provided for the Graduate and Professional Student Government to become a separate governing body and representative organization for graduate students. In outlining the reasons for this separation, the GPSG cited the need for a GPSG office and the graduate student share of student activity fees to support: departmental graduate student associations, graduate student travel to read papers and present research at academic conferences, and development of a Graduate Student Research Symposium.

During the 1998-1999 academic year, GPSG began functioning as its own governing body. In the 1999-2000 academic year, the recognition of current (and new) graduate student organizations and the funding of these groups, including the GPSG, became the responsibility of the Graduate and Professional Student Government. In 2019, GPSG formally separated from SGA to become its own separate organization. Since the inception of the GPSG, the availability of student activity fees to graduate students directly have increased dramatically. GPSG has been very successful in advocating for and supporting graduate student needs. An annual Research Symposium competition was begun in the spring of 2001 to showcase and reward excellence in graduate student research across all disciplines. GPSG continues to be active in new graduate student orientation, encouraging and recognizing graduate student organizations and increasing the amount of student activity fee support for graduate students. Each graduate program has the opportunity to be represented on the GPSG senate.

The GPSG Office is located in the Student Union. More information can be found online at gpsg.charlotte.edu.

Graduate Student Organizations

There are a number of graduate student organizations directly associated with academic programs. These include:

- Advocates for Change (AFC)

- American Society for Computational Mechanics (ASCM)
- American Society for Precision Engineering (ASPE)
- Anthropology Graduate Student Association (AGSA)
- Association of Biological Sciences Graduate Students (ABSGS)
- Association of Chemistry Graduate Students (ACGS)
- Association of Nanoscience Graduate Students (ANGS)
- Bioinformatics Assembly of Students (BiAS)
- Biology Graduate Outreach
- CCI Grads (CCI Grads)
- Charlotte Healthcare Executive Student Organization (CHESO)
- Children's Literature Graduate Organization (CLGO)
- Club for A.I. Research (CAIR)
- Communication Studies Graduate Student Association (CSGSA)
- Ekush-Bangladeshi Student Organization at UNC Charlotte (EKUSH)
- English Graduate Student Association (EGSA)
- Geography and Earth Science Graduate Organization (GESGO)
- Gerald G. Fox GFOA Student Chapter
- Giftedness, Creativity, Innovation, and Talent Research (G-CITE)
- Graduate and Professional Student Government (GPSG)
- Graduate Business Association (GBA)
- Graduate History Association (GHA)
- Graduate Public Health Association (GPHA)
- Graduate Public Policy Association (GPPA)
- Graduate Social Work Association (GSWA)
- Health Psychology Graduate Student Association (HPCSA)
- LGBTQ+ Graduate Coalition
- Master of Architecture Student Society (MASS)
- Mathematics Graduate Student Association
- Mu Tau Beta (Counseling) (MTB)
- Philosophical Union UNCC (Philosophical Union)
- Public Administration Student Association (PASA)_
- School of Data Science Student Organization (SDS SO)
- Sociology Graduate Student Association (SGSA)
- SPIE/OSA Student Chapter at UNC Charlotte (SPIE)
- Urban Educators for Change (UEC)

Information on each group is available from the individual academic program department. Some groups have information available on the Student Organizations website at ninerengage.uncc.edu/organizations?categories=9859.

ADMISSION TO THE GRADUATE SCHOOL

Admissions Information

It is the policy of the University that educational decisions are based on relevant and appropriate factors and cannot be based on an individual's protected status, whether that status is protected by law or by University policy. As a result, admissions decisions are based on a holistic review of an individual's abilities and qualifications, including academic history, professional experience related to the educational program, recommendations provided by individuals who can reference an applicant's potential for success, and skills necessary for achievement in a particular discipline. The intent of the Graduate School is to offer admission to those applicants whose credentials indicate a strong likelihood of success in their selected curricula.

The University reserves the right to withhold or rescind the admission and enrollment of a person who: (1) fails to meet any of the requirements for admission at the time of matriculation, (2) fails to maintain satisfactory academic performance in their course of study prior to enrollment, or (3) provides incorrect or misleading information on the application for admission or supporting document set. Additionally, meeting the minimum admission requirements does not guarantee admission to a graduate program and the University reserves the right to restrict enrollments when necessary because of budgetary and/or other capacity constraints.

Application Materials

An application, processing fee, and if applicable, other required items specific to the program must be submitted for **each** graduate program of study for which a student applies for admission. Answers to commonly asked questions are available on the Graduate Admissions website and may also be directed to:

Graduate Admissions
 UNC Charlotte
 9201 University City Boulevard
 Charlotte, NC 28223-0001
 Telephone: 704-687-5503
 E-mail: gradapponline@charlotte.edu
 Web: gradadmissions.charlotte.edu

Application Deadlines

Prospective students are encouraged to apply and submit all supporting documents well in advance of a program's published deadlines. *Many programs have earlier deadlines than the Graduate School's priority and final*

deadlines and may only admit students to a particular semester or term. Prospective students should view information on the academic program website for the most up-to-date details regarding application requirements, admission, and funding. The Graduate School may alter the date for acceptance of applications without further notice in accordance with available resources and/or the enrollment limitation established by the North Carolina General Assembly or the University. Note that applications received or applications that become complete after a program's deadlines or the Graduate School's priority deadlines are processed on a space-available basis or they may be withdrawn from consideration.

Term of Entry	Application and Supporting Documents	Final
	Priority Submission Deadline	Application Deadline
Fall	March 1	August 1
Spring	October 1	December 1
Summer*	April 1	June 15

** There are a variety of sessions that begin with a Fall, Spring or Summer term, beginning and ending on different dates; however, deadlines to register may vary. For the Summer term, June 15 is the last day an application for admission can be submitted, but this date is for classes that begin in July.*

Note: International students who intend to enroll on an F-1 or J-1 visa status should apply for admission before the priority deadlines.

Application Processing

Applicants apply for admission online; instructions and the application are available at gradadmissions.charlotte.edu. Applications of U.S. Citizens, U.S. Permanent Residents, Asylees, and Refugees are processed as “domestic” applications. Applications of students on or who intend to be on temporary visa/status in the U.S. (i.e., F-1, H-1, H-4, etc.), as well as Pending Permanent Residents, are processed as “international” applications.

Application Processing Fee

Submission of the online application for admission to graduate study requires online payment of the U.S. application fee by credit card. Note that the application fee may change and the amount required is accurately reflected in the application instructions available online. The fee is waived or refunded for certain full-time employed University employees (lifetime limit of six waivers per person), military students, and McNair Scholars; otherwise, the processing fee is required and nonrefundable. Fraudulent use of a credit card to pay the University's application fee will result in reconsideration of

the admissions application and may result in revocation of any offer of admission.

Types of Admission

(For Doctoral Degrees, Master's Degrees, and Graduate Certificates)

Early Entry to Graduate Programs

Exceptional undergraduate students at UNC Charlotte may be accepted into some certificate, master's, and doctoral programs and begin work toward a graduate certificate or degree before completion of the baccalaureate degree. In those programs offering this option, an applicant may be accepted at any time after completion of 75 or more credit hours of their undergraduate coursework, although it is expected that at least 90 credit hours of undergraduate coursework will have been earned by the time the first graduate course is taken. These students will have provisional acceptance status in the graduate program, pending the award of the baccalaureate degree.

To be accepted to this program, the student must complete an application online at gradadmissions.charlotte.edu/apply for the given graduate program and be approved for it. In addition, the student must complete the Early Entry Graduate Academic Petition, which requires approval by the Undergraduate Advisor, the Graduate Program Director, and the Graduate School. The petition is available on the Graduate School website under Current Students. *[Note: The Early Entry Program Petition must be approved by the Graduate School before the student begins the Early Entry graduate coursework. Failure to obtain prior Graduate School approval negates the ability to “double count” courses in an accelerated Early Entry Program.]* An undergraduate student must have at least a 3.2 overall GPA and have taken the appropriate graduate standardized test and earned an acceptable score, if required by the academic program. A given program may have more rigorous admissions criteria. If an Early Entry student has not met the normal admission requirements of a 3.0 overall undergraduate GPA at the end of their baccalaureate degree, they will be dismissed from the graduate program.

Students accepted into an Early Entry Program will be considered subject to the same policies that pertain to other matriculated graduate students. However, the undergraduate program will remain the student's primary program. Early Entry students are eligible only for undergraduate-level financial aid, grants, and tuition awards.* Early Entry students are restricted to 15 credit hours of graduate level coursework prior to the completion of the baccalaureate degree. No courses taken before admission to the graduate program may be

applied to a graduate degree.

Some Early Entry Programs permit students to “double count” graduate-level coursework towards outstanding requirements for the undergraduate degree. The maximum number of graduate credits which may be “double counted” towards an undergraduate degree varies by program. However, under no circumstances will more than 12 credit hours be double-counted. Students use the Early Entry Petition to detail which courses they plan to “double count” and which courses will be taken solely for graduate credit. Only those graduate-level courses which are applied towards the undergraduate degree are eligible for undergraduate-level financial aid.

Many graduate programs currently offer an Early Entry option. A list of Early Entry Programs may be found on the Graduate Admissions website at gradadmissions.charlotte.edu/programs/early-entry. To be considered for Early Entry admission, a student must submit a completed application via the Graduate School's admissions system at gradadmissions.charlotte.edu/apply and provide supporting documents.

**Note: While students admitted to an Early Entry Program are not eligible to hold a graduate assistantship since they have not completed a baccalaureate degree, they may be considered for a Student Temporary Wage position. Students admitted into an Early Entry Program pay undergraduate fees and undergraduate tuition for all courses (graduate and undergraduate) for which they register until such time that the baccalaureate degree is completed (typically within two semesters).*

Accelerated Master's Programs

Exceptional undergraduate students may be accepted into an Accelerated Master's Program whereby they simultaneously pursue the baccalaureate and master's degrees and gain invaluable mentoring and research experience along the way. The Accelerated Master's Program may also be accelerated in which up to 12 credit hours earned at the graduate level may be substituted (“double counted”) for required undergraduate hours. A list of Accelerated Master's Programs may be found on the Undergraduate Admissions website at admissions.charlotte.edu/academics/accelerated-masters-programs.

In the programs offering this option, an applicant may be considered for admission to the Master's Program directly from high school with a minimum GPA 3.75 or above (on a 4.0 scale) and a minimum score of 1220 on the SAT. For details, see the Undergraduate Admissions website at admissions.charlotte.edu/academics/accelerated-masters-programs.

Note: Students admitted to an Accelerated Master's Program (undergraduate + graduate degrees) are not eligible to hold a graduate assistantship until their final year of study when they are only taking graduate courses. In the Accelerated Master's Program of study, when only graduate courses are taken (typically the final year of study), students are considered “graduate” students and are charged graduate tuition and fees.

Dual Undergraduate and Graduate Registration

First undergraduate degree students at UNC Charlotte who are required to take fewer than 12 credit hours of undergraduate work to fulfill all requirements for the bachelor's degree may be allowed during their final semester to enroll in certain courses for the purpose of obtaining graduate credit. Dually enrolled students will continue to be considered undergraduate students and be charged for the courses taken at the undergraduate level. The total credit hours to be carried in this status shall not exceed 12 credit hours, of which no more than nine may be for graduate credit. On the basis of work attempted prior to the final semester, such students must meet the grade point criteria for admission to a graduate degree program at the University. No course for which credit is applied to an undergraduate degree may receive graduate credit. Permission to take graduate courses under dual registration does not constitute admission to any graduate degree program at the University. (Undergraduate students may also take graduate courses if admitted to an Early Entry Program or an Accelerated Master's Program.)

Note: Only UNC Charlotte students pursuing their first undergraduate degree are eligible for dual undergraduate and graduate registration. Fifth year undergraduate students (i.e., students pursuing a second undergraduate degree) are not eligible for dual undergraduate and graduate enrollment.

Full Standing

Applicants who meet the general requirements for admission to graduate study, plus any additional requirements specified by the program, may be offered admission.

Applicants offered admission to graduate programs who have not yet completed their undergraduate degree and/or who were admitted with unofficial transcripts will be allowed to register for one semester and can only continue after the Graduate School's receipt of official final transcripts (and/or the diploma/degree certificates/mark sheets) indicating the award of the baccalaureate (bachelor's/undergraduate) degree from an institution accredited by an accepted accrediting body* or its equivalent. Students will have a maximum of one semester to enroll, after which time a hold will be placed on their accounts to prevent registration for future terms.

Failure to submit the proper credentials during the first semester of enrollment will result in a hold on registration for subsequent terms.

** Accepted Accrediting Body: the following are accepted accrediting bodies: Accrediting Commission for Community and Junior Colleges (ACCJC) Western Association of Schools and Colleges, Higher Learning Commission (HLC), Middle States Commission on Higher Education (MSCHE), New England Commission of Higher Education (NECHE), Northwest Commission on Colleges and Universities (NWCCU), Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), and WASC Senior College and University Commission (WSCUC).*

Deferment Policy

Applicants admitted to a graduate program of study may request to defer their admission for up to one year. Deferment is not guaranteed. The request will be considered by the academic department and the Office of Graduate Admissions. If deferment of admission is approved and the applicant does not enroll, the admission is withdrawn. To be considered for admission to a future term, the individual will have to submit a new application, application fee, recommendations, transcripts, and other required items.

Policy on Updating Applications

Applicants who do not complete their application in time to be considered for admission to the term on their application may request their application be updated to the next term. After updating the application, if the applicant does not complete the application, they will need to reapply to be considered for a future term.

Applicants whose application was denied will need to reapply if they wish to be considered for admission to a different term or program.

General Application Requirements for Admission

Doctoral Degree Programs

To be considered for admission to a doctoral program, an applicant must have a bachelor's degree (or its U.S. equivalent) from a college or university that is accredited by an accepted accrediting body. Some programs admit baccalaureate (bachelor's degree) students directly to the doctoral program, while others require applicants to have earned a master's degree.

To be admitted to a doctoral program after a master's program, an applicant should have earned an overall grade point average of at least 3.5 (on a 4.0 scale) in the master's

degree program. To be admitted to a doctoral program after a bachelor's program, an applicant should have earned an overall GPA of at least 3.0 in the bachelor's degree program. Individual programs may have additional application/admission requirements as specified in program descriptions in this *Graduate Catalog* and/or the program's websites. Applicants must also be in good academic standing at the last institution of higher education attended; otherwise, the individual must not have been enrolled for two years prior to being considered for admission to a graduate program at UNC Charlotte.

Master's Degree Programs

The applicant must possess at least a bachelor's degree, or its U.S. equivalent, from a college or university accredited by an accepted accrediting body, and must have attained an overall grade point average of at least 3.0 (based on a 4.0 scale) on all of the applicant's previous work beyond high school. If an applicant has earned or attempted a post-baccalaureate degree (i.e., a master's, doctoral, or other), grades in that program will also be taken into consideration. Individual programs may have additional application/admission requirements as specified in program descriptions in this *Graduate Catalog* and/or the program's website. Applicants must also be in good academic standing at the last institution of higher education attended; otherwise, the individual must not have been enrolled for two years prior to being considered for admission to a graduate program at UNC Charlotte.

Graduate Certificate Programs

The applicant must possess at least a bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body, and must have attained an overall grade point average of at least 2.75 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school). If the applicant has earned or attempted a post-baccalaureate degree (i.e., master's, doctoral, or other), grades in that program will also be taken into consideration. Individual programs may have additional application/admission requirements as specified in program descriptions in this *Graduate Catalog* and/or the program's website. Applicants must also be in good academic standing at the last institution of higher education attended; otherwise, the individual must not have been enrolled for two years prior to being considered for admission to a graduate program at UNC Charlotte.

Applications generally consist of the items listed below. Any materials submitted in support of an application for admission to graduate study become the property of the University and cannot be returned to the applicant.

- 1) The **application form** must be submitted online through the Graduate School's application system. The online application system can be accessed via

gradadmissions.charlotte.edu. Submission of the application form requires payment of an application fee, which is paid online by credit card; the fee is neither deductible nor refundable.

- 2) A **Statement of Purpose** (personal essay) must be submitted online as part of the application submission process. The Statement of Purpose describes the applicant's experience, objectives for undertaking graduate study and research interests, if known. [Note: Some graduate programs request specific items to be included in the Statement of Purpose. Applicants should check the department's website or contact the department directly for further clarification on specific requirements related to the Statement of Purpose.]
- 3) **Transcripts** of all academic work attempted beyond high (secondary) school are required of all students offered admission who enroll at UNC Charlotte. For the application and admission processes, current/unofficial transcripts of each academic institution of higher education ever attended must be submitted (and must be uploaded directly to the online application); transfer credit posted on the records of other institutions is unacceptable and transcripts of these credits must be supplied. Applicants who have taken early college credits during high school must provide transcripts showing college credit. International transcripts must be issued in English by the institution or be accompanied by an English translation by an official, certified translation company.
- 4) If required by the program, **one to three recommendations** from persons familiar with the applicant's academic and/or professional qualifications should be submitted. Note that many graduate certificate programs do not require recommendations. If required, the recommendation forms must be submitted via the online application system; letters of reference in support of an individual's admission may also be uploaded directly to the online recommendation form. Recommendations or letters sent to the Graduate School in any other format, including surface mail and email, may not be processed or considered as part of the application file.
- 5) If required by the program, official agency reports of **satisfactory test scores** as specified in the section on graduate programs in this Catalog. GRE/GMAT scores are reportable from ETS for a period of five years from the date of the exam. Likewise, the Graduate School accepts GRE/GMAT scores which are up to five years old as part of the application process. GRE/GMAT scores older than five years are therefore not acceptable since they cannot be

officially reported. Likewise, MAT scores more than five years old are not accepted. MCAT, LSAT, and PAEP scores are accepted by some graduate programs and should be no older than five years. For additional information regarding test score requirements, please see the "Test Information" section of this *Catalog*.

- 6) **Official scores** on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution. The Graduate School requires either a minimum score of 83 on the Internet-based TOEFL, a minimum score of 557 on the paper-based TOEFL, or a minimum overall band score of 6.5 on the IELTS. Some graduate programs require higher scores.

Notes:

- 1) *Applicants with records of high quality who do not fulfill these requirements should discuss with the Graduate Program Director other factors that may have a bearing on admission. Some programs have higher standards or additional admission requirements. Additionally, there may be prerequisites for certain programs and applicants should consult the Graduate Program Director to identify prerequisites. A separate application for admission is required for each graduate, post-baccalaureate, and certificate program of study at UNC Charlotte.*
- 2) *All applicants submitting transcripts and degree certificates from non-U.S. educational institutions should note that bachelor's degrees awarded by non-U.S. schools may or may not be considered equivalent to the U.S. bachelor's degree. Recipients of degrees that are not at least equivalent to a U.S. bachelor's degree may not be eligible for graduate study at UNC Charlotte.*
- 3) *International Students should see the "Additional Admission Requirements for all International Applicants" section of this Catalog for additional requirements.*

Post-Baccalaureate (Non-Degree) Program

The applicant must possess a bachelor's degree, or its U.S. equivalent, from a college or university accredited by an accepted accrediting body. UNC Charlotte students having less than 12 credit hours to complete their first undergraduate degree may be allowed to enroll as a post-baccalaureate (non-degree) student; see "Dual Undergraduate and Graduate Registration" in the Degree Requirements and Academic Policies section. Applicants must also be in good academic standing at the last institution of higher education attended; otherwise, the individual must not have been enrolled for two years prior

to being considered for admission to a graduate program at UNC Charlotte.

Applications generally consist of the items listed below and should be submitted online. Application materials submitted in support of an application for admission to graduate study, including non-degree study, become the property of the University and cannot be returned to the applicant.

- 1) The **application form** must be submitted online through the Graduate School's application system. The online application system can be accessed via gradadmissions.charlotte.edu. Submission of the application requires payment of an application fee, which is paid online by credit card; the fee is neither deductible nor refundable.
- 2) **Official scores** on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution. Required is either a minimum score of 83 on the Internet-based TOEFL, a minimum score of 557 on the paper-based TOEFL, or a minimum overall band score of 6.5 on the IELTS.

Notes:

- 1) *A separate application for admission is required for each graduate-level program of study, whether post-baccalaureate (non-degree), certificate, master's, or doctoral programs. A post-baccalaureate (non-degree) student who subsequently applies and is admitted to a graduate degree program may, with the permission of their advisor and the Graduate School, apply a maximum of six credit hours completed in the post-baccalaureate (non-degree) status toward a graduate degree or certificate program.*
- 2) *International Students should see the "Additional Admission Requirements for all International Applicants" section of this Catalog for additional requirements.*

Additional Admission Requirements for all International Applicants and/or Applicants Whose Native Language is Not English

Success at UNC Charlotte depends upon a student's ability to converse in, write, and understand (U.S.) English. To assure such competence, any applicant whose native language is other than English must submit an official TOEFL, IELTS, or Duolingo score. To be considered official, the scores must be sent directly from the testing agency to UNC Charlotte. Typically, testing agencies retain scores for two years.

Applicants who meet one of the following criteria are exempt from the English language proficiency requirement:

1. Has completed at least one academic year of post-secondary (academic) study in the U.S. (*or an approved country) within five years of the proposed term of enrollment.
2. Has completed at least one full calendar year of professional work experience in the United States (*or an approved country) in a position where English is heavily used in writing and speaking.

*Approved Countries with English as the Primary Language

Australia, Bahamas, Barbados, Belize, Bermuda, Canada (exception of the Province of Québec), Dominica, Fiji, Gambia, Ghana, Grenada, Guyana, Ireland, Jamaica, Kenya, Lesotho, Malawi, New Zealand, Nigeria, Philippines, Sierra Leone, Singapore, South Africa, St. Kitts, Trinidad and Tobago, Uganda, United Kingdom, United States and territories, and Zimbabwe.

Applicants who do not meet the minimum English language proficiency requirement cannot be admitted. They may, however, choose to enroll at UNC Charlotte's English Language Training Institute (ELTI) and e-apply to the Graduate School once English language proficiency is obtained. See ELTI's website for details.

Additional Enrollment Requirements for International Applicants on, or Intending to be on, F-1 or J-1 Visa Status

Upon admission, students will be asked to confirm their enrollment. Additionally, the International Student Scholar Office will request students to complete an online Financial Certificate Form and upload financial documents. The International Student and Scholar Office is responsible for issuing I-20s and DS-2019s.

Test Information

Applicants to programs that require submission of test scores should have their official test scores sent directly from the testing agency to the Office of Graduate Admissions (not to the department in which they wish to study). For the GRE and TOEFL, UNC Charlotte's institution code is 5105. For the MAT, UNC Charlotte's institution code is 1370. For the GMAT, please visit gradadmissions.charlotte.edu/apply-now/application-requirements/test-scores to determine the code of the program to which you plan to apply for admission.

Some graduate programs have specific test waivers for applicants to their programs; check the Graduate Catalog for details regarding program-specific waiver criteria and/or communicate directly with the Graduate Program Director.

Graduate Record Examination (GRE)

The GRE is administered by Educational Testing Service (ETS). To obtain information about and schedule a test for the GRE, please visit the GRE website at gre.org. UNC Charlotte's school code is 5105.

Miller Analogies Test (MAT)

Harcourt Assessment, Inc administers the MAT. For additional information on the MAT, please visit milleranalogies.com.

Graduate Management Admission Test (GMAT)

The GMAT is sponsored, owned, and directed by the Graduate Management Admission Council (GMAC) and is administered by Pearson VUE. Visit the GMAC website at mba.com for additional information and to register for the GMAT. The GMAT Customer Service Telephone in the Americas is 1-800-717-GMAT (4628). See the Graduate Admissions website at gradadmissions.charlotte.edu/apply-now/application-requirements/test-scores for the school codes.

Test of English as a Foreign Language (TOEFL)

Administered by Educational Testing Service (ETS)

- Minimum Score Required: 83 Internet-based
- Official scores sent directly from Educational Testing Service (ETS) are required.
- UNC Charlotte's school code is 5105. A department code is not necessary.
- *MyBest* Scores are accepted. Applicants must send all individual scores and not just their "*MyBest Scores*."
- Registration: Visit the TOEFL website (toefl.org).

International English Language Testing System (IELTS)

Jointly managed by University of Cambridge ESO Examinations, British Council, and IDP:IELTS Australia

- Minimum Score Required: Overall band score of 6.5
- Official scores must be sent directly from the testing center to UNC Charlotte.
- Request scores be sent electronically to University of North Carolina Charlotte Graduate Admissions.
- Registration: Visit the IELTS website (ielts.org).

Duolingo English Test

Provided by Duolingo

- Minimum Proficiency Score Required: 115
- Official scores should be made available electronically to the University of North Carolina at Charlotte Graduate School via the Duolingo test taker portal.
- Registration: Visit the Duolingo English Test website (englishtest.duolingo.com).

English Language Training Institute (ELTI)

UNC Charlotte accredited intensive English program for academic language development in a university setting.

- Minimum proficiency: Completion of the last level of the program (Level 5) with a final grade of B (80%) or higher.
- Curriculum, application requirements, dates and schedule, and tuition and fees schedule: Visit the ELTI website (<https://elti.charlotte.edu/programs/university-preparation>).
- The ELTI will work with the Graduate School to identify current ELTI students who seek admission to UNC Charlotte graduate programs. The ELTI Program Director will send a memo of completion along with a final grade report for any eligible student to the Associate Dean of the Graduate School at the conclusion of the semester.

Appeal Procedure for Applicants Denied Admission

Applicants denied admission may appeal the decision but only on the grounds that the denial was based on a violation of Section II of the University's Admissions Policy. Essentially, the policy maintains that if an applicant is denied admission to the Graduate School, they may appeal the decision based solely on the grounds that the denial violates University admissions policy not to discriminate in offering access to its educational programs and activities on the basis of age, gender, race, color, national origin, religion, creed, disability, veteran's status, sexual orientation, gender identity, or gender expression.

The appeal must be in writing, must set forth with specificity the grounds for the appeal, and must be directed and delivered to the Dean of the Graduate School. Upon receipt of the appeal, the Dean will review the applicant-appellant's file and appeal letter and will communicate their decision to the applicant-appellant in writing within thirty (30) calendar days of receipt of the appeal. Appeals must be received prior to the term for which the applicant is seeking admission. If there is insufficient time to complete the appeal process before the beginning of the term for which the applicant seeks admission, the Dean of the Graduate School may decline to review the appeal. For more information, see Appendix A to University Policy 207 online at legal.charlotte.edu/policies/up-207/appendix-a.

Health Requirements

Health Insurance Requirements

Health insurance is required of all degree-seeking undergraduate students with six or more on-campus credit hours; all degree- or certificate-seeking graduate students with three or more on-campus credit hours; and all international students with an F-1 or J-1 visa, regardless of credit hours.

Students who are currently uninsured may enroll in the Student Health Insurance Plan by completing the enrollment form found on the Student Health website at studenthealth.charlotte.edu. Pricing is available on the site as well.

Students with existing health insurance coverage must supply this information online to Student Health every Fall and Spring semester by the posted due date. See the Student Health website above for details. Failure to comply will result in automatic enrollment in the Student Health Insurance Plan for the semester.

Immunization Requirements

To protect all students at UNC Charlotte, North Carolina state law requires proof of immunizations upon entering the University. Under North Carolina regulations, students not in compliance will be dropped from all courses. **Upon learning of admission to the University, students should submit their immunization records immediately.** Immunization Records must be uploaded via the Online Student Health Portal. Further details regarding the immunization requirements and the records submission process are available online from Student Health at studenthealth.charlotte.edu. Please consult the website for more detail about the requirements before submitting records to the University. Although a health physical is not required for admission to the University, students are strongly encouraged to contact their healthcare provider or local health department to discuss additional recommendations for vaccinations.

COLLEGE/UNIVERSITY VACCINES AND NUMBER OF DOSES REQUIRED	
Vaccines Required	Dosage
Tetanus, Diphtheria, Acellular Pertussis (Tdap) ¹	1
Diphtheria, Tetanus, and/or Pertussis ¹	2
Polio ²	3
Measles ³	2
Mumps ⁴	2
Rubella ⁵	1
Hepatitis B ⁶	3
Varicella ⁷	1

FOOTNOTE ¹– Three doses of tetanus/diphtheria toxoid, of which one must be tetanus/diphtheria/pertussis (Tdap). Students enrolling in a 4-year college or university for the first time on or after July 1, 2008, must receive a tetanus/diphtheria/Pertussis (Tdap) vaccine.

FOOTNOTE ²– An individual attending school who has attained his or her 18th birthday is not required to receive polio vaccine.

FOOTNOTE ³– Measles vaccines are not required if any of the following occur: Diagnoses of disease prior to January 1, 1994; An individual who has been documented by serological testing to have a protective antibody titer against measles and submits the lab report; or An individual born prior to 1957. An individual who enrolled in college or university for the first time before July 1, 1994, is not required to have a second dose of measles vaccine.

FOOTNOTE ⁴– Mumps vaccine is not required if any of the following occur: An individual who has been documented by serological testing to have a protective antibody titer against mumps and submits the lab report; An individual born prior to 1957; or Enrolled in college or university for the first time before July 1, 1994. An individual entering college or university prior to July 1, 2008, is not required to receive a second dose of mumps vaccine.

FOOTNOTE ⁵– Rubella vaccine is not required if any of the following occur: 50 years of age or older; Enrolled in college or university before February 1, 1989 and after their 30th birthday; An individual who has been documented by serological testing to have a protective antibody titer against rubella and submits the lab report.

FOOTNOTE ⁶– Hepatitis B vaccine is not required if any of the following occur: Born before July 1, 1994. Serological testing to document protective antibody titer against Hepatitis B is not acceptable.

FOOTNOTE ⁷– Varicella vaccine is not required if any of the following occur: Documented physician diagnosis of disease, a student has been documented by serological testing to have a protective antibody titer against varicella and submits the lab report; or a student is born before April 1, 2001.

International Students

Vaccines are required as noted above. Additionally, International students are required to have a TB skin test and negative result within the 12 months preceding the first day of classes (chest x-ray required if test is positive). A TB blood test (T-spot, QuantiFERON Gold Plus) is also accepted.

Freshman and Transfer Students

Immunization records are not sent with other admission records from your previous school. You must request your immunization records be sent directly to Student Health.

Immunization Policy Reinstatements

At least 21 days prior to the start of classes, students who are not in compliance will receive a communication from Student Health (SH) with details on how to comply with state law. Students who remain in noncompliance as determined by SH will be withdrawn from all applicable courses by the Office of the Registrar at the end of the thirty (30) day period. Students are therefore strongly encouraged to submit their immunization records prior to the start of the semester. Student Health also will monitor students who are not in compliance but have been approved by SH for an extension to receive the necessary immunizations as indicated by a physician's letter. Once the date for the extension expires, and if the student is still not in compliance, Student Health will notify the Office of the Registrar that the student has failed to comply with Immunization Requirements. The Office of the Registrar

will then withdraw the student from all applicable courses.

Students will be reinstated to their courses after providing evidence of compliance with immunization requirements to the SHC before the end of the last class day of the semester. This reinstatement pertains only to student enrollment status and does not in any way guarantee that the academic, financial, and/or other consequences of noncompliance with immunization requirements can or will be remedied. Such consequences may include, but are not limited to, impact on immigration status, financial aid eligibility, University housing, and University accounts. Additionally, reinstated students may not be eligible to make up class work, assignments, tests, or exams as faculty are encouraged but are not obligated to allow make-up work as appropriate.

Decisions under this policy cannot be appealed, and students will not be reinstated if they become compliant with immunization policies after the last class day of the semester.

Contact Information

Questions regarding these mandatory requirements may be directed to the Student Health Center Immunizations Department at 704-687-7424 or immuinfo@charlotte.edu.

WORKPLACE COMPETENCIES

- Graduate Certificate in Workplace Competencies

The Center for Graduate Life and Learning
gradlife.charlotte.edu

Graduate Certificate in Workplace Competencies

The Graduate Certificate in Workplace Competencies responds to specific documented needs of employers for employees with graduate and professional degrees who are also well-versed in basic workplace competencies such as written and verbal communication, presentation-building, managing new initiatives, and personnel management. It is designed for graduate students across all disciplines, those with recently minted undergraduate degrees who wish to bolster their job market prospects, and young professionals in the local Charlotte business community who wish to enhance their career prospects.

Admission Requirements

- A bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body
- A cumulative GPA of 2.75 (out of a 4-point scale) for all work completed beyond high school
- An online application through the Graduate School's application system
- A statement of purpose
- Unofficial transcripts of all college coursework attempted
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution

Certificate Requirements

This certificate program requires the completion of 12 credit hours. All requirements must be completed within four years.

Core Courses (6 credit hours)

GRAD 6304 - Intrapreneurship for Non-Business Majors - The Practice of Internal Entrepreneurs (2)
GRAD 6320 - Personal Career Branding: Identity, Management, and Promotion (2)
GRAD 6340 - Data Analysis and Visualization (2)

Elective Courses (6 credit hours)

Select from the following:

ENGL 6116 - Technical/Professional Writing (3)
GRAD 6330 - Workplace Communications (2)
MBAD 6161 - Human Behavior in Organizations (3)
MBAD 6165 - Negotiation and Conflict Management (3)
MBAD 6279 - Design Thinking and Innovation (3)

Note: Requests for course substitutions may be approved by Graduate Program Director.

Grade Requirements

Students must earn a minimum cumulative GPA of 3.0.

Certificate Total = 12 Credit Hours



University Regulation of Student Conduct

As students willingly accept the benefits of membership in the UNC Charlotte community, they also commit to obligations to observe and uphold the principles and standards of conduct that reflect the values of the UNC Charlotte community.

At UNC Charlotte, *University Policy 406, The Code of Student Responsibility*, fulfills the duty of the Chancellor to regulate matters of student conduct in the University community. *University Policy 407, The Code of Student Academic Integrity*, governs student behavior relating to academic work. All UNC Charlotte students are expected to be familiar with both Codes and to conduct themselves in accordance with these requirements. Any person may report an alleged violation(s) of the Code online at incidentreport.charlotte.edu. Individuals may report crimes or incidents involving imminent threat of harm to Police and Public Safety at 704-687-2200.

The University has also established a program for the prevention of the use of illegal drugs and alcohol abuse (*University Policy 711*), as well as a policy regulating smoking and tobacco product use on campus (*University Policy 707*). All UNC Charlotte students are obligated to be familiar with and to conduct themselves in accordance with the standards set forth in these policies.

Additionally, the Student Government Association has created a code called *The Noble Niner* that solidifies the high standard of morals, principles, and integrity that all students should strive to uphold the reputation of excellence at UNC Charlotte.

THE CODE OF STUDENT ACADEMIC INTEGRITY

<https://legal.charlotte.edu/policies/up-407>

Below is a brief summary of *University Policy 407, Code of Student Academic Integrity*. Visit legal.charlotte.edu/policies/up-407 for a full version of that policy.

The Code of Student Academic Integrity governs the responsibility of students to maintain integrity in academic work, defines violations of the standards, describes

procedures for handling alleged violations of the standards, and lists applicable penalties. Except in cases of Research Misconduct, as set forth in *Chapter 3, Section III.3 of the Code*, the following conduct, or complicity in the following conduct, is considered Academic Misconduct under the Code:

- A) **Cheating** using or attempting to use materials, or giving assistance or materials without Authorization to another in any academic exercise that could result in gaining or helping another to gain academic advantage. Cheating includes, but is not limited, to the following actions:
 - 1) Copying - copying from another's assignment, examination, or other academic exercise;

- 2) Use of Unauthorized Materials - using materials or equipment in connection with an assignment, examination, or other academic exercise which have not been authorized by the faculty member, including but not limited to, notes, calculator, websites, or other technology;
- 3) Misrepresentation - permitting another to substitute for one's self in an academic exercise, or submitting of an academic exercise that has been prepared by another;
- 4) Unauthorized Collaboration - sharing the work or effort in an academic exercise with another individual or individuals without Authorization. See examples.
- B) **Fabrication** means providing fabricated information, including inventing or counterfeiting information, in any form in an academic exercise. See examples.
- C) **Falsification** means altering without Authorization any data or information, regardless of communication method (e.g., e-mail or other electronic communication), in an academic exercise. See examples.
- D) **Misuse of Academic Materials** means sharing, distributing, altering, acquiring, damaging, or making inaccessible academic materials without Authorization, that could result in gaining or helping another to gain an academic advantage. See examples.
- E) **Multiple Submission** means submitting academic work or substantial portions of the same academic work (including oral reports) in more than one academic exercise without Authorization. See examples.
- F) **Plagiarism** means presenting the words or ideas of another as one's own words or ideas, including failing to properly acknowledge a source, unless the ideas or information are common knowledge. Plagiarism includes self-plagiarism, which is the use of one's own previous work in another context without indicating that it was used previously. See examples.
- G) **Research Misconduct** means a determination that Research Misconduct has occurred under University Policy 309, Responding to Allegations of Misconduct in Research and Scholarship and its Supplemental Procedures. (See Chapter 3, Section III of the Code.)

A full explanation of these definitions, and a description of procedures used in cases where student violations are alleged, is found in the complete text of University Policy 407, The Code of Student Academic Integrity, as it may be modified from time to time. Students are advised to contact the Office of Student Accountability & Conflict Resolution or visit legal.charlotte.edu/policies/up-407 to ensure they consult the most recent edition.

THE CODE OF STUDENT RESPONSIBILITY

legal.charlotte.edu/policies/up-406

Below is a brief summary of University Policy 406, Code of Student Responsibility. Visit legal.charlotte.edu/policies/up406 for a full version of that policy.

All UNC Charlotte Students are expected to be familiar with University policies and procedures, and to conduct themselves accordingly.

University Policy 406, Code of Student Responsibility ("the Code") fulfills the duty of the Chancellor to regulate matters of Student behavior in the University community.

University Policy 407, Code of Student Academic Integrity, governs Student behavior relating to academic work.

University Policy 501, Nondiscrimination; University Policy 502, Sexual Misconduct and Interpersonal Violence; and University Policy 504, Title IX Grievance Policy, govern behavior related to discrimination, discriminatory harassment, and sexual or interpersonal misconduct, respectively. Any such allegations against Students are processed under those policies and not under this Code. See the Office of Civil Rights and Title IX website for more information.

All Student inquiries concerning the Code of Student Responsibility or University Policy 407 should be directed to the Associate Dean of Students and Director of Student Accountability & Conflict Resolution ("Director").

Philosophy and Purpose

The mission of Student Accountability & Conflict Resolution is to uphold academic and community standards; encourage personal accountability and responsible decision making; promote Student learning; and reduce and prevent behavior that undermines Student success and community safety.

Consistent with UNC Board of Governors Policy 700.4.2, the University is committed to providing a fair, impartial, and efficient process facilitated through compassionate conversations in which Students are heard, respected, and treated with dignity. All Students are responsible for conducting themselves in a manner that helps enhance an environment of learning in which the rights, dignity, value, and freedom of each member of the academic community

are respected.

The University works to create and sustain an environment where freedom of speech and expression are supported and honored. The University has the discretion to regulate the time, place, and manner of exercising these and other Constitutionally-protected rights. In administering this Code, the University will exercise care to preserve the freedom of speech and expression for all in the campus community.

The University must balance its commitment to preserving Student rights, encouraging responsible growth and development of its Students, protecting the rights of those targeted by Student actions, and holding Students accountable for their actions. This balance is achieved through the use of a full spectrum approach that includes adjudicatory and alternative resolution options.

The purpose of this Code is to define what behavior is prohibited, Students' rights and resolution options, and the range of outcomes that may be implemented.

Prohibited Behaviors, Procedures, and Outcomes

Chapter 3 of the Code (legal.charlotte.edu/policies/up-406#ch3) includes a list of behaviors that are prohibited by the Code, **including, but not limited to**, acts of harm (physical injury, fear/risk, harassment/intimidation/bullying, unwanted conduct, etc.), alcohol violations, disorderly behavior, disruption of University activities, drug violations, false identification, fire safety, hazing, misrepresentation, retaliation, theft, trespassing, unauthorized recording, vandalism, violation of law, violation of University policies/regulations, and weapons violations. For a full explanation of all conduct prohibited under the Code, consult Chapter 3 of the Code at legal.charlotte.edu/policies/up-406#ch3.

Chapter 4 of the Code (legal.charlotte.edu/policies/up-406#ch4) provides the accountability procedures. Specific procedures for adjudicating cases are detailed in the [Procedures for Case Resolution](#) supplemental to the Code.

Chapter 5 of the Code (legal.charlotte.edu/policies/up-406#ch5) details possible outcomes imposed on Students or Student Organizations found responsible for violating the Code.

Chapter 6 of the Code (legal.charlotte.edu/policies/up-406#ch6) provides information on appeals.

A full explanation of prohibited behaviors, and a description of procedures used in cases where violations are alleged, including appeals processes, are found in the complete text of [The Code of Student Responsibility](#) and the [Procedures for Case Resolution](#), as they may be modified from time to time. Students are advised to contact the Office of

Student Accountability and Conflict Resolution or visit legal.charlotte.edu/policies/up-406 to ensure they consult the most recent edition.

Sexual Misconduct and Interpersonal Violence

legal.charlotte.edu/policies/chapter-500

The University of North Carolina at Charlotte is committed to providing a respectful, safe, and inclusive environment for all University community members and guests of the University. Unlawful discrimination and discriminatory harassment, including any form of sexual misconduct or interpersonal violence, undermine the mission of the University and will not be tolerated. The University also strictly prohibits retaliation against individuals for reporting sexual misconduct or interpersonal violence or for cooperating in the University's investigation of sexual misconduct or interpersonal violence. The University's applicable policies, available in [Chapter 500 of University Policies](#), set forth expectations for creating and maintaining an environment free of sexual misconduct and interpersonal violence. The [procedures](#) applicable to specific complaints, including but not limited to retaliation, are available on the [Office of Civil Rights and Title IX website](#).

Sexual misconduct (including but not limited to sexual harassment and sexual exploitation) and interpersonal violence (including sexual assault, dating violence, domestic violence, and stalking) are violations of both law and University policy and will not be tolerated in the University community. Such behaviors are particularly sensitive issues that could affect any member of the University community, and as such, reports of sexual misconduct and interpersonal violence will be dealt with promptly and equitably by the University administration, regardless of whether the allegations are made formally, informally, in writing, or verbally.

Anyone may report alleged sexual misconduct or interpersonal violence against a student, faculty member, or staff member to the University's Office of Civil Rights and Title IX. All University employees are expected to report alleged violations of these policies to the [University's Office of Civil Rights and Title IX](#) and may be subject to disciplinary action, up to and including dismissal, for failing to report.

The University's Office of Civil Rights and Title IX will contact the individual who reportedly experienced a violation of the applicable policy and discuss with the individual available accommodations, resources, and

resolution options. The University's Office of Civil Rights and Title IX will assist the individual in utilizing the applicable University process for that individual's report, as set forth on the Office of Civil Rights and Title IX website. For more information, see civilrights.charlotte.edu/.

THE PROGRAM TO PREVENT USE OF ILLEGAL DRUGS AND ALCOHOL ABUSE

legal.charlotte.edu/policies/up-711

Below is a brief summary of University Policy 711, Program to Prevent Use of Illegal Drugs and Alcohol Abuse. Visit legal.charlotte.edu/policies/up-711 for a full version of that policy.

In keeping with efforts to maintain an environment that supports and encourages the pursuit and dissemination of knowledge, it is the policy of The University of North Carolina at Charlotte to consider the use of illegal drugs or alcohol abuse by students, faculty and staff or by others on premises under University control to be unacceptable conduct that adversely affects the educational environment.

To remind students, faculty, and staff of their responsibilities for maintaining a drug-free environment, this Policy will be distributed throughout the University community each year. Further, the University considers a sound awareness, education, and training program indispensable in combating illegal use of drugs and alcohol abuse, both as a preventive measure and as a remedy. The scope of the University program addresses the awareness needs of students, faculty, administrators, and other staff members and includes the following minimum components.

- The health hazards associated with the use of illegal drugs and alcohol abuse.
- The incompatibility of the use of illegal drugs or abuse of alcohol with maximum achievement of personal, social, and educational goals.
- The potential legal consequences (including both criminal law and University discipline) of illegal drug use and alcohol abuse.
- The effective use of available campus and community resources in dealing with illegal drug use and alcohol abuse problems.

It is the responsibility of all students, faculty, and staff to conduct themselves in a way that contributes to an environment free of illegal drug use and abuse of alcohol. In addition, students, faculty and staff are responsible, as citizens, for knowing about and complying with the provisions of North Carolina law that make it a crime to possess, sell, deliver, or manufacture those drugs designated collectively as "controlled substances" in Article 5 of Chapter 90 of the North Carolina General Statutes, as well as federal law (Drug Free Workplace Act), which prohibits unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance in the workplace of any employer receiving federal grant funds.

The Center for Wellness Promotion is responsible for designing and carrying out a program of awareness education and training for students on the subject of preventing the illegal use of drugs and abuse of alcohol. The Center also coordinates a collegiate recovery program, which provides consultation and referral to appropriate facilities in the community for students who may be in need of treatment for substance use disorders and support to students in recovery from chemical dependence.

Counseling and Psychological Services (CAPS) shall, within the limits of available resources, provide services and programs to students seeking assistance with problems of illegal drug use or alcohol abuse. In cases in which the treatment needs of such students exceed the resources of the Center, the Center shall provide referral to appropriate facilities in the community.

The University's program emphasizes collaboration with local resources, including the Center for Prevention Services, Dilworth Center for Chemical Dependency, Anuvia Prevention and Recovery Center, McLeod Addictive Disease Center, Carolinas Medical Center Behavioral Health Services, Eastover Psychological and Psychiatric Group, The Insight Program, Alcoholics Anonymous, Narcotics Anonymous, Al-Anon, and Nar-Anon. To this end, the University shall participate in the Charlotte-Mecklenburg Drug Free Coalition and will work with local advisory boards to further collaborate between the University and the Charlotte community.

The University's awareness, education, and training efforts stress prevention. The goal of these efforts is (1) to encourage non-users of illegal drugs and alcohol to continue to be non-users, (2) to encourage users of alcohol to do so safely and responsibly, and (3) to encourage users of illegal drugs to stop such use.

The use of illegal drugs and the abuse of alcohol are considered by the University to be problems that can be overcome. Therefore, the educational and rehabilitative

services cited above are available on a confidential basis. However, the possession, sale, delivery, or manufacture of illegal drugs will not be tolerated on campus or off campus in the event that the interests of the University may be affected.

The University will cooperate fully with law enforcement agencies and will apply appropriate disciplinary procedures should a student violate criminal statutes with regard to illegal drugs or alcohol abuse. Violations may subject a student to prosecution and punishment by civil authorities **and** to conduct action by the University.

When a student has been charged by the University with a violation of policies concerning illegal drug use or alcohol abuse, they may be suspended from enrollment before initiation or completion of regular disciplinary proceedings if the Chancellor or the Chancellor's designee concludes that the student's continued presence within the University community would constitute a clear and immediate danger to the health or welfare of other members of the University community. If such a suspension is imposed, an appropriate hearing of the charges against the suspended person shall be held in accordance with the Code of Student Responsibility.

SMOKING AND USE OF TOBACCO PRODUCTS ON UNIVERSITY PROPERTY

legal.charlotte.edu/policies/up-707

Below is a brief summary of University Policy 707, Smoking and Use of Tobacco Products on University Property. Visit legal.charlotte.edu/policies/up-707 for a full version of that Policy.

The University of North Carolina at Charlotte has a vital interest in maintaining a healthy and safe environment for its students, faculty, staff and visitors while respecting individual choice about smoking and use of tobacco products. Consistent with these concerns and with North Carolina law, the following Policy establishes restrictions on smoking and use of tobacco products on University Property and provides procedures for accommodating the preferences of both smokers and non-smokers.

For the purposes of this Policy:

- A) "Smoking" is defined as the use or possession of a lighted cigarette, lighted cigar, lighted pipe, or any other lighted tobacco product, or the use of an electronic inhaler that employs a mechanical heating element, battery, or electronic circuit to heat a liquid nicotine solution contained in a vapor cartridge, such as an electronic cigarette, electronic cigar, electronic cigarillo, or an electronic pipe.
- B) "Tobacco product" means a cigarette, a cigar, chewing tobacco, vapor product, or any other product that contains tobacco and is intended for inhalation, oral use, or nasal use. The term does not include nicotine patches, nicotine gum, nicotine lozenges, or other tobacco cessation products.
- C) A "Building" is defined as any permanent or temporary structure utilized for the support, shelter or enclosure of people, animals, or property. "Buildings" include, but are not limited to: residence halls; classroom and office buildings; workshops; shuttle, light rail, and bus stops; all recreational and athletic facilities, including athletic fields, gymnasiums, and stadiums; parking decks; stairwells; inside and outside dining areas; vending areas; breezeways; and connectors.
- D) A "University Building" is defined as any Building owned, leased as lessor, or the area leased as lessee and occupied by UNC Charlotte.
- E) "University Property" means University Buildings and grounds owned, leased, operated, controlled, or supervised by UNC Charlotte.
- F) A "University Vehicle" is defined as a vehicle owned or leased by UNC Charlotte.
- G) A "Designated Smoking Area" is defined as an exterior area on the UNC Charlotte campus designated by the Chancellor or the Chancellor's designee as a place for smoking. Designated Smoking Areas will be marked by proper signage, and are subject to the provisions in Section III of this Policy.

Section III. The following restrictions apply to smoking and use of tobacco products on University Property:

- A) Smoking and use of tobacco products is prohibited within all University Buildings.
- B) Smoking is prohibited within 100 linear feet of any University Building unless otherwise allowed under subsection III. D.
- C) Smoking and use of tobacco products in University Vehicles is prohibited.
- D) Smoking is permitted on University Property in Designated Smoking Areas. See the Smoking Policy Map at: https://facilities.charlotte.edu/wp-content/uploads/sites/1297/2024/05/Uncc_Smoking_Map.pdf.

Additional restrictions on smoking or use of tobacco products required for safety reasons may be imposed by the University on a case-by-case basis. Areas with such

restrictions will be identified by signage.

Cooperation and consideration between smokers and non-smokers, and between users and non-users of tobacco products is necessary to ensure the successful implementation of this Policy. Effective implementation of this Policy depends upon the courtesy, respect, and cooperation of all members of the University community.

Violation of this Policy may subject a student to conduct action under the Code of Student Responsibility.

NOBLE NINER CODE

studentaffairs.charlotte.edu/niner-code

The Noble Niner Code was authored by the Student Government Association and describes the ideals which every Charlotte 49er student can ideally reach as they become a fully actualized individual.

It was approved by the UNC Charlotte Board of Trustees on April 20, 2007, and is now adopted as an official document of the University.

Scholarship

A Niner shall strive for academic excellence in and out of the classroom while maintaining academic integrity.

Integrity

A Niner shall act to uphold and improve one's self, the community, and the high standards of the institution.

Respect

A Niner shall welcome all aspects of individuality and self-worth while embracing the learning opportunities that our community provides.

Accountability

A Niner shall hold others responsible for their actions while accepting responsibility for one's own.

Dignity

A Niner shall appreciate the intrinsic value of the institution and work to preserve the 49er environment.

Honor

A Niner shall appreciate students, faculty, administration, and staff as contributing members of the University community.

Compassion

A Niner shall demonstrate genuine consideration and concern for the needs, feelings, ideas, and well-being of others.

Character

A Niner shall exemplify all qualities and traits that promote fellowship and camaraderie among the student body, faculty, staff, and administration.

Nobility

A Niner shall exhibit the virtues and values listed above which befit all members of our Niner Nation.



Degree Requirements and Academic Policies

REGISTRATION

The Office of the Registrar is responsible for the management of the registration process by which students enroll in, drop, and withdraw from courses. Through the registration process, students assume academic and financial responsibility for the courses in which they enroll. They are relieved of these responsibilities only by formally terminating enrollment by dropping or withdrawing in accordance with deadlines specified in the Academic Calendar and the corresponding prorated refund schedule available on the Niner Central website at ninercentral.charlotte.edu/billing-payments-refunds/refunds-financial-aid.

Registration Deadlines

University policies determine when students may enroll or adjust their enrollment in courses. General deadlines are shown below and specific deadlines for a given term are available online at registrar.charlotte.edu/calendar-schedules.

Add/Drop Period

The Add/Drop period runs through the 6th business day of the Fall and Spring full terms and on the 2nd business day

for Fall and Spring half terms, as well as Summer full and half terms.

During the Add/Drop Period, students can:

- Register for courses
- Drop a course(s) without record (and remain enrolled in other courses)
- Drop all courses without record
- Change the grade type to Pass/Unsatisfactory (refer to the Pass/Unsatisfactory Option in the Grading policy)

After the Add/Drop Period students can withdraw from one or more courses in accordance with the Withdrawal policy.

Prerequisites and Permits

All students, including visitors and non-degree students, are required to meet course prerequisites and to obtain the required permissions to enroll in courses through the department which sponsors the course.

Auditing Courses

With the permission of the instructor and Graduate School, a Graduate Student may audit any course in which space is available. Fees and procedures for this non-credit enrollment are the same as those for a credit enrollment.

The procedure for adding, dropping, or withdrawing from an audit course is the same as for credit enrollments. In order to audit a class, a student must register for the course, then complete a Graduate Academic Petition and receive approval from the instructor and the Graduate School by the withdrawal deadline of a semester.

No student will be allowed to change the designation of a course from audit to credit or from credit to audit after the withdrawal deadline of a semester (or a proportional period for Summer terms). Participation of auditors in course discussions and in tests or examinations is optional with the instructor. Students who audit receive no University credit, but they are expected to attend the course regularly.

Inter-Institutional Registration

An inter-institutional registration program is available, for a limited number of undergraduate and graduate students, with the University of North Carolina at Greensboro, North Carolina State University, University of North Carolina at Chapel Hill, Duke University, and North Carolina Central University. The registration process is initiated in the Office of the Registrar and requires, via an Inter-institutional Approval Form, the approval of the student's College Dean and the Associate Dean of the Graduate School. The proposed course cannot be offered at UNC Charlotte. Enrollment for Inter-Institutional is normally limited to the following:

- **Fall and Spring terms:** two courses per term for a graduate or professional student provided that the student is also registered for the balance of their normal load at UNC Charlotte.
- **Summer terms:** one course per summer term provided the student is also registered for at least three hours per session at UNC Charlotte.

Tuition will be billed by UNC Charlotte for all courses taken, including the Inter-Institutional courses, at the prevailing tuition rate. Fees will be waived at the visiting institution unless there is a special fee associated with a particular course. In such a case, the student is responsible for payment of the fee. Students must adhere to the academic calendar for all adds, drops, and withdrawals at both institutions.

Continuous Registration and Leave of Absence

Graduate students who are in the research phase of their thesis, dissertation, project, or directed study must be continuously enrolled during the Fall and Spring semesters. All graduate students must be enrolled during the semester they plan to graduate, which may include the summer semester. To remain continuously enrolled, graduate students may register for any graduate credit-bearing or,

when appropriate, residency course. Graduate students who need to interrupt their studies for up to two consecutive semesters, must seek approval for a Leave of Absence through the Graduate Academic Petition system. Students experiencing a medical emergency or other crisis should contact the Student Assistant and Support Services (SASS) office.

Students in graduate degree programs are required to maintain continuous registration each Fall and Spring semester, excluding Summer terms, for thesis, dissertation, project, or directed study until work is completed. The continuous registration requirement begins with the semester in which the student first registers for thesis, dissertation, project, or directed study. Students working in research laboratories must be granted access in compliance with departmental policy.

Degree-seeking graduate students who are in good standing may request a leave of absence for up to two consecutive Fall and/or Spring semesters with the condition that they will not use University resources during their absence. Graduate students choosing this option must submit a Graduate Academic Petition for a leave of absence. Graduate students who have taken an approved leave of absence for two consecutive semesters must contact the Graduate School to have their enrollment reactivated prior to the end of the second semester. A leave of absence may impact financial aid, funding, immigration status, and health and wellness services. Graduate students considering these options should first consult with their academic advisor and any other relevant office (i.e., ISSO) to understand the possible ramifications of taking a leave. Graduate students with questions about the leave of absence option are encouraged to contact The Graduate School.

Transfer Credit

Students enrolled in a graduate degree program at UNC Charlotte may transfer graduate credit appropriate to their program earned at UNC Charlotte or other institutions, subject to the conditions stated below. Students may request transfer credit through a Graduate Academic Petition. Students are held to the policies published for the Graduate Catalog year reflected on their degree audit.

Graduate Credit Earned at UNC Charlotte

Students may transfer graduate credit earned at UNC Charlotte under the following conditions:

- The course credit is appropriate to the degree program in which the student is enrolled and subject to approval by the Graduate Program Director and the Graduate School
- The credit earned is within the published program time limits as outlined in the Catalog

- The student received a grade of C or above for the course and the overall GPA remains at or above 3.0 (See Academic Standing and Grading and Related Policies in the applicable Graduate Catalog)

Restrictions:

- The capstone requirement for a master's program cannot be transferred
- Up to 9 hours of master's capstone or thesis credit may transfer into a doctoral program as elective credit
- Undergraduate coursework is not transferable for graduate credit
- Coursework taken as part of an earned master's or doctorate degree is not transferable to a degree at UNC Charlotte at the same or lower level
- Coursework taken as part of an earned certificate is not transferable to another certificate program at UNC Charlotte.

Graduate Credit Earned at Other Institutions

- Master's students may transfer up to 30% of the total credit hours required for a master's degree or certificate program, and doctoral students may transfer up to 30 credit hours from other institutions under the following conditions:
- The course credit is appropriate to the degree program in which the student is enrolled and subject to approval by the Graduate Program Director and the Graduate School
- The credit earned is within the published program time limits as outlined in the Catalog
- The student received a grade of B or above as defined by UNC Charlotte; coursework that has been graded on a Pass/No Credit or Satisfactory/Unsatisfactory basis will be accepted for transfer if equivalent to an A or B grade at UNC Charlotte (See Grading and Related Policies in the applicable Graduate Catalog)

Restrictions:

- Coursework taken as part of an externally earned master's or doctorate degree is not transferable to a degree at UNC Charlotte at the same or lower level
- The capstone requirement for a master's program cannot be transferred
- Graduate credit from other institutions may not be applied to Advanced Standing Tracks for doctoral programs. (See Ph.D. Degree Requirements in the applicable Graduate Catalog)
- Credit taken under the quarter system will be converted to semester hour credit; partial or fractional credits cannot be not awarded
- Graduate courses that appear in the undergraduate section of a transcript are only transferable if they were not counted toward the student's

undergraduate degree

- Up to 9 hours of master's capstone or thesis credit may transfer into a doctoral program as elective credit

Credit by Examination

A student currently enrolled in a certificate or degree program at UNC Charlotte may pass a specially prepared challenge examination and receive credit for a University course without having to do the required coursework. The student contacts the program in which credit is sought to request administration of an examination. Since it may not be appropriate to award credit by examination for some courses, the decision to offer an examination is that of the program. If the graduate program authorizes an examination, the student is instructed to pay the fee for credit by examination and to bring the receipt of payment to the examination. Credit by examination will be indicated on the transcript, but no grade points will be awarded. The grade will appear as a Pass or Unsatisfactory grade. Failure on such an examination will incur no grade-point penalty. No student may challenge a course for which either a passing or failing grade has been received at UNC Charlotte.

Change of Degree Program

To change from one degree program to another, a graduate student must complete the application for admission to the new program, pay the requisite application fee, submit a Statement of Purpose, and provide supporting documentation as specified in this *Catalog* in a timely manner and be recommended by the Graduate Program Director for admission to the new program of study, with the Graduate School rendering the final decision. The student should also provide the Graduate School with a letter indicating withdrawal from the initial degree program.

Note: Students on F-1 or J-1 visa status who change from one degree program to another may be required to submit proof of sufficient financial resources, especially if the change to another degree program requires the issuance of a new Form I-20 or DS-2019.

Application for the Degree and/or Graduate Certificate

All graduate students, including certificate students, must submit the Online Graduation Application no later than the published deadline in the term of graduation. The Online Graduation Application can be found at my.charlotte.edu under "Student Records". Degrees and certificates are conferred at commencement exercises held at the end of each semester; however, the diploma, graduate certificate, and/or transcript will reflect the term in which all requirements were completed. Master's diplomas and graduate certificates are mailed directly to the student

after graduation clearance has been completed.

Students participate in the commencement ceremony at the end of the term in which they complete their degree and/or certificate requirements.

Degree Audits

DegreeWorks (available via my.charlotte.edu) contains the definitive degree audit for each graduate student, based on the approved curriculum for the program. Students are encouraged to review their individual audit each semester to ensure they are making satisfactory progress towards graduation. In the term of graduation, each candidate's DegreeWorks audit will be reviewed for accuracy by the graduate program and the Graduate School. All program requirements specified in DegreeWorks must be met before the degree or certificate will be awarded. If an audit does not appear accurate, a student should consult with the director of their graduate program to determine if an academic petition is necessary.

Earning a Second Degree

A student is permitted to earn a second graduate degree subject to the following conditions:

- 1) no work applied to a previously awarded degree may be applied to the new degree program
- 2) the student must be admitted to a degree program different from that of their previous graduate degree(s)
- 3) the student must successfully meet all requirements for the new degree

Dual Master's Degrees

Students can simultaneously complete two complementary graduate degree programs at UNC Charlotte through an established integrated curriculum. This curriculum meets the unique requirements of both degree programs, while allowing for shared credit for a specified set of courses.

This policy applies when both programs in the dual degree are offered by UNC Charlotte. It does not apply to dual degree arrangements with other institutions. Those programs are held to the policies outlined in their Memorandum of Understanding.

Although other restrictions may apply, basic admission and degree requirements are specified below:

The student must apply to each program separately and be admitted to both by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived.

- 1) Once admitted, the Graduate School must be notified by the Graduate Program Directors of the student's intent to pursue the dual degree.
- 2) All students pursuing a dual degree must have a graduate advisor who is a regular member of the graduate faculty from each program.
- 3) 70% of the credits required for each individual degree must be unique, leaving 30% that can be shared based on the approved integrated curriculum.
- 4) The student must complete the capstone requirement for each program.
- 5) If the student withdraws or is suspended from one of the participating programs, the dual degree arrangement is automatically nullified.
- 6) All graduate degree requirements and academic policies apply to dual degree arrangements.
- 7) Students must graduate from both programs in the same semester.
- 8) No dual degrees will be awarded retroactively.
- 9) In cases where the dual degree has not been formally approved and published in the Graduate Catalog, the Graduate Program Directors must develop an integrated plan of study meeting all dual degree policies including articulation of shared courses. This plan of study must be signed by both Graduate Program Directors and submitted to the Graduate School within the first semester of a student's matriculation.

Termination of Enrollment

Once a student has registered for classes and it becomes necessary to terminate the registration, there are two possible courses of action: (1) cancellation of enrollment, or (2) withdrawal from classes and/or from the University. The method of registration termination depends upon the circumstances in each individual case.

Cancellation of Enrollment

A Cancellation of Enrollment will be processed for any student who has not paid their tuition and fees or made arrangements by the due date listed on the academic calendar at registrar.charlotte.edu/calendar-schedules. A Cancellation Notice will be emailed to the student's UNC Charlotte email address. Other circumstances that may also result in a cancellation include, but are not limited to: being academically ineligible to continue in school; failure to pay tuition and fees; documented emergency; military deployment; and student conduct sanctions.

The Dean of Students Office may authorize a Cancellation of Enrollment through the University's Office of the Registrar within the add/drop period for documented medical or personal crises or for reasons related to military deployment or required military training.

Dropping all courses prior to the last day of the add/drop period is the process by which a student cancels

enrollment for the term. A student who wishes to cancel enrollment must do so via My UNC Charlotte at my.charlotte.edu. In cases where a new graduate student fails to enroll in the first term following admission to a graduate program, the Graduate School will withdraw the student's admission.

Withdrawals

Students are allowed opportunities to withdraw themselves from classes and receive a grade of W. The deadline to withdraw from one or more courses (including withdrawal from all courses) is at the 60% completion point of the term. The precise date for each term will be published in the Academic Calendar at registrar.charlotte.edu/calendar-schedules. After this deadline, late withdrawal will only be allowed for approved extenuating circumstances. A grade of W will be recorded for each withdrawal without extenuating circumstances. Courses marked W do not count in GPA calculations, but do count in attempted hour calculations for all graduate students.

International students on F-1 or J-1 visa status must carry a full course load each academic semester. *(Some exceptions apply. See the International Student and Scholar Office for further information.)* Students who withdraw from UNC Charlotte are advised to consult the International Student and Scholar Office for information on maintaining valid F-1 or J-1 status, or reinstatement to valid F-1 or J-1 status.

Note: In situations where a student withdraws from all courses, the student must terminate all financial obligations with the University such as financial aid, housing, assistantships, etc., by completing necessary paperwork in each office.

Withdrawals (for Extenuating Circumstances)

Students who experience a current term personal or medical crisis or military deployment may request a withdrawal with extenuating circumstances through the Dean of Students Office. In very rare circumstances, students who wish to request a withdrawal with extenuating circumstances for past terms must submit an academic petition to the Graduate School. If a student's request for a withdrawal with extenuating circumstances is approved, the student will be removed from registered classes with a transcript notation of "WE" and a withdrawal tag will be placed on the student's registration. If a student's request for a withdrawal with extenuating circumstances is denied, graduate students may appeal that decision to the Dean of the Graduate School.

Termination by the University

The University maintains the right to terminate a student's enrollment in a course for a variety of reasons including, but not limited to: course schedule changes, course

cancellation due to low enrollment, or the student's nonfulfillment of course prerequisites. The University maintains the right to terminate a student's enrollment in all courses in a term for a variety of reasons including, but not limited to: academic suspension, suspension for violation of the Code of Student Responsibility, or suspension in violation of the Code of Student Academic Integrity. Students who have been suspended for academic or disciplinary reasons must either appeal or reapply for admission as described in the Readmission of Former Students policy. See Academic Standing/Appeal Procedure.

ACADEMIC LOAD/ TIME STATUS FOR ALL GRADUATE STUDENTS

UNC Charlotte uses a standard Academic Load to determine time status of graduate students for Loan Deferment, Financial Aid, Visa Status, Payroll Tax Withholding, Graduate Assistant Support Plan, and Veteran's Benefits. This Academic Load is the only resource used to determine a student's status for these purposes, and the following definitions apply to all graduate students, U.S. and international, participants and non-participants in the Graduate Assistant Support Plan (GASP).

An appropriate course load is dependent upon two factors: (1) the scholastic ability of the student as reflected by their academic history and (2) the time available for study. A course load of 9 credit hours constitutes a normal full semester program for a graduate student in a Fall or Spring semester, while 6 credit hours constitutes a normal full load in the Summer. This is lower than the normal undergraduate load because of the extensive reading, independent thinking, and individual research required of graduate students. Graduate students should not register for more than 12 credit hours during a Fall or Spring semester or 9 credit hours in a Summer term.

Students who hold an eligible graduate assistantship may hold the assistantship with 6 credit hours, unless they participate in the Graduate Assistant Support Plan (GASP) in which case they must be full-time enrolled as defined below. Students enrolled in 6 credit hours, however, are not considered to be enrolled full-time.

International students on F-1 visa/status are required, by immigration regulations, to pursue a full course load during each academic semester, except during official school breaks (e.g., summer vacation and winter holidays) unless a reduced course load is approved in advance by the

Designated School Officer (DSO) at the International Student Scholar Office. Failure to enroll for a full course load without prior approval is considered a violation of the F-1 legal status. International students who hold a graduate assistantship must be full-time enrolled as defined below.

Fall and Spring Semesters

Graduate students enrolled in a doctoral program with a dissertation or in a master's program and pursuing the thesis option.

- To be considered Full-Time, students must:
 - o Enroll in at least 9 credit hours per semester, or
 - o Have completed coursework and the number of thesis/dissertation hours for credit in their graduate degree program, as well as the requisite milestones, and are approved to take GRAD 9800 or GRAD 7800 for 3 credit hours (may be repeatable with prior approval), or
- Three Quarter (3/4) Time: 7-8 credit hours
- Half (1/2) Time: 5-6 credit hours
- Less than Half (1/2) Time: 1-4 credit hours
- Maximum Load: 12 credit hours

Graduate students enrolled in a degree program not requiring a thesis or dissertation.

- Full-Time: 9 or more credit hours
- Three Quarter (3/4) Time: 7-8 credit hours
- Half (1/2) Time: 5-6 credit hours
- Less than Half (1/2) Time: 1-4 credit hours
- Maximum Load: 12 credit hours

Summer Terms

Graduate students enrolled in any program.

- Full-Time: 6 or more credit hours
- Three Quarter (3/4) Time: 4-5 credit hours
- Half (1/2) Time: 3 credit hours
- Less than Half (1/2) Time: 1-2 credit hours
- Maximum Load: 9 credit hours

COURSE ATTENDANCE AND PARTICIPATION

Instructors determine their course policies (including attendance and participation) as long as such policies do not conflict with University policies. Such policies should be pedagogically appropriate. In general, students are expected to attend all scheduled sessions in the courses

for which they are registered, participate fully in the learning process, demonstrate respectful behavior while interacting with instructors and peers, and complete all of the course requirements. Instructors may outline additional and more specific standards in the course syllabus, especially when attendance and/or participation are part of the grading criteria for the course.

University-Sanctioned Activities

University-sanctioned events or activities are considered excused absences. A University-sanctioned event or activity is one in which a student formally represents the University to external constituencies in athletic or academic activities. This policy does not supersede individual program attendance and/or participation requirements that are aligned with accreditation or licensure.

Student Responsibilities

- 1) Notification
 - a) A student must inform the instructor of any absence as soon as possible. For any excused absence, a student must inform the instructor no later than the last day of the add/drop period, except when newly added or unforeseen circumstances occur (e.g., a playoff event).
 - b) Notification/Documentation of planned excused absences must be made in writing and delivered by the student electronically or in a face-to-face meeting with the instructor of each class that the student is requesting an excused absence.
- 2) Student experiences that cannot be made up should be discussed with the instructor at the onset of the course to ensure that continued enrollment is feasible while the opportunity to drop the class exists.
- 3) Students are responsible for fulfilling any course requirements that occur during the time they are absent from class.
- 4) Students are expected to maintain satisfactory progress in the course.

Instructor Responsibilities

- 1) Instructors should utilize best practices with regards to course attendance and participation including but not limited to:
 - a) Prioritizing active participation in and engagement with the educational process over course attendance as a measure of student involvement.
 - b) Establish rules of engagement in the syllabus, clarify the course instruction format as in-person, online (synchronous or asynchronous), or a hybrid of in-person and online, and identify multiple ways in which students can demonstrate satisfactory participation. In hybrid or entirely online courses, for example, this could

include camera usage, chat boxes, online forums, etc.

- c) If the course has a policy regarding a limited number of allowed absences, University-sanctioned activities should not count against that limit. In addition, students cannot be required to utilize a “drop” option for work missed afforded to all students due to a University-sanctioned event.
 - d) If a student has a valid University-excused absence, they are entitled to make up missed work for full credit in whatever manner the instructor deems appropriate.
- 2) If student responsibilities are met, the instructor will honor valid University-excused absences that are not already included in other individual instructor excused absences policies.
 - 3) The instructor may impose appropriate academic penalties if the student fails to satisfactorily complete the alternate assignment or examination within a reasonable timeframe.
 - 4) Required activities outside of class hours that are used for graded participation must be stated in the syllabus. If the required activity falls on a specific date/time, the instructor must provide an alternative assignment, unless the activity is foundational to the course (e.g., a theater performance produced by the class). Such foundational class activities should be included in the course “Notes” in the Banner Schedule. If the activity is one that can be completed over the course of the term and is not limited to a specific date/time, no alternative assignment is required.
 - 5) Additional absences from class may be excused by the instructor. Whenever possible, students are expected to seek the permission of the instructor prior to any absences. Examples of valid reasons for consideration of absences include:
 - a) Documented illness
 - b) Serious personal or family emergencies
 - c) Court-imposed legal obligations such as subpoenas or jury duty
 - d) Military obligations
 - e) Academic and/or extracurricular activities
 - f) Religious observances; absences for religious holidays fall under University Policy 409, Religious Accommodation for Students at legal.charlotte.edu/policies/up-409
 - g) Documented quarantining for in-person classes
 - 6) If students believe they have been penalized or unjustly treated because of participation in a University-authorized activity, they can appeal using the following sequence of appeal to (1) the instructor, (2) unit chairperson and (3) the appropriate college dean or designee (college offering the course). The decision of the dean is considered final.

GRADING

Instructors assign grades on the basis of their evaluation of the academic performance of each student enrolled in their courses. At the end of the term, the grades are reported to the Office of the Registrar which is responsible for maintaining student academic records and making grades available to students.

Grades

Letters are used to designate the quality of student academic achievement.

Graduate Grades		
Grade	Definition	Grade Points per Credit Hour
A	Commendable	4
B	Satisfactory	3
C	Marginal	2
I	Incomplete	
NG	Temporary Unreported Grade	
P	Pass	
U	Unsatisfactory	0
SP	Satisfactory Progress	
UP	Unsatisfactory Progress	
W	Withdrawal	
WE	Withdrawal with Extenuating Circumstances	
N	No Credit	
UX	Academic Dishonesty Violation	
AU	Audit	
NR	No recognition given for audit	

Grade of I (Incomplete)

The grade of I is assigned at the discretion of the instructor when a student who is otherwise passing has not, due to circumstances beyond their control, completed all the work in the course. The missing work must be completed by the deadline specified by the instructor, but no later than 12 months. If the I is not removed during the specified time, a grade of U as appropriate is automatically assigned. Time extensions for the completion of an I beyond one year cannot be approved except by a Graduate Academic Petition to the Graduate School under extraordinary circumstances. The grade of I cannot be removed by enrolling again in the same course, and students should not re-enroll in a course in which they have been assigned the grade of I. A grade of I cannot be

replaced with a grade of W (Withdrawal).

Grade of P/U (Pass/Unsatisfactory) Option

Certain graduate courses, such as research seminars, tutorials, and internships, may be designated for Pass/Unsatisfactory grading upon recommendation of the offering department and approval of the Graduate Council. The grade of P (Pass) in such a course shall be considered as evidence of satisfactory performance. A grade of U (Unsatisfactory) will affect eligibility for continued enrollment and will not apply toward requirements for the degree. Graduate students may not elect the Pass/Unsatisfactory option for a standard graded course, with the exception of GRAD courses.

Grade of SP/UP (Satisfactory Progress/Unsatisfactory Progress) Option

The grade of SP (satisfactory progress) or UP (unsatisfactory progress) is assigned to graduate coursework for research activity that extends over more than one semester, typically dissertation or thesis research. It is important to align expectations as to what acceptable progress looks like, particularly when research goes beyond one semester.

Students receive a grade of SP (Satisfactory Progress) or UP (Unsatisfactory Progress) indicative of meeting these expectations. These grades are not factored into the GPA but do count toward hours attempted; and in the case of a grade of SP, toward hours earned and degree progression. The credit indicates that the student continued to be enrolled, which protects status related services that require enrollment. The assessment of progress is managed by the student's advisor and graduate program director.

It is possible for a student to be registered in multiple sections of research in a given semester. The student could earn both SP and UP grades that term, thereby making partial progress. If an advisor assigns a grade of UP, they must discuss the reasons for the grade as well as expectations for remediation and research continuance with the student; and summarize the outcome in writing. When a student receives a second or subsequent grade of UP, the advisor and the graduate program director will review and discuss the lack of progress with the student and document their findings which may include a recommendation to the Graduate School to terminate the course of study.

Grade of W (Withdrawal)

No grade will be given for a course dropped on or before the last day to drop a course without record. After this period, a student is permitted to withdraw from a course with a grade of W, in accordance with the conditions and deadlines of the Withdrawals policy. Post-deadline

withdrawal is only allowed for approved extenuating circumstances. Unsatisfactory academic performance itself is not an extenuating circumstance. The date of withdrawal is determined when the "Withdrawal" notification is received by the Office of the Registrar. The grade of W is posted on the academic transcript.

Grade of WE (Withdrawal for Extenuating Circumstances)

After the deadline to withdraw from a course, a student may, in certain circumstances, request to withdraw from their courses based on an extenuating circumstance (i.e., a medical emergency, a death in the immediate family, or other serious event). The student must provide documentation to support their request. WE requests for the current term are submitted through the Office of the Dean of Students. Although rarely granted, WE requests for prior terms are submitted through the Graduate School using the Academic Petition tool. If approved, a grade of WE is noted on the student's transcript.

Grade of N (No Credit)

The grade of N (No Credit) is used in very special circumstances. The N grade signifies that there is no credit given for the course. Therefore, any course that receives the N grade does not enter into the student's grade point average. The N grade is used for the master's and doctoral level, resident and non-resident, and graduate student continuing registration courses (GRAD 7999 or GRAD 9999). The N grade is also used to replace IP grades which have expired, and for GRAD 8990. These are the only three uses for the N grade.

Grade of UX (Academic Dishonesty Violation)

For details on the use of the UX grade, please see University Policy 407, Code of Student Academic Integrity, Section IV - Penalties at legal.charlotte.edu/policies/up-407#IV.

Grade Point Average (GPA)

The grade point average for a graduate student is based only on those graduate courses taken at UNC Charlotte. It is determined by multiplying the number of grade points for each grade (A=4, B=3, C=2, U=0) by the number of credit hours credit received in that courses adding all accumulated grade points together, and then dividing by the total number of credit hours the student has attempted except those for which the student received a grade of I, IP, SP, UP, W, P, N, AU, or NR. When a course not listed as "May be repeated for credit" is repeated, no additional credit hours attempted accrue and the hours earned and grade points of the previous grade are replaced by those of the current grade in their degree plan of study.

Graduate students must have a 3.0 GPA in the courses on their degree plan of study in order to graduate. However,

the grades for all courses attempted will remain on the transcript and will be included in the calculation of the student's cumulative GPA as it is reported on the transcript (except as described in the above paragraph).

Repeating Graduate Courses

Graduate students are allowed to repeat a maximum of two courses in which the student has been assigned a grade of C or U (but not an I). If the course grade has resulted in suspension or termination of enrollment, the student must appeal to be reinstated in order to repeat the course. A given course may be repeated one time only. Each grade earned in a repeated course is shown on the student's transcript. The record of the first attempt remains a part of the student's permanent record and counts in the number of marginal (C) grades accumulated and the overall GPA. However, the hours earned and grade in the first attempt are not computed in the program GPA used for graduation clearance. Successfully repeating a course does not change the number of marginal (C) grades accumulated. Enrollment will be terminated if a student receives a grade of U in a repeated course for which the student previously earned a U.

Final Grades

Final grades are available through the secure student access pages of My UNC Charlotte online at my.charlotte.edu.

Final Grade Changes and Appeals from Final Course Grades

When a final course grade other than Incomplete (I) is officially reported by the instructor at the end of an academic term, the grade is recorded by the Office of the Registrar and can be changed only if the grade has been assigned arbitrarily or impermissibly as defined in University Policy 410, *Policy and Procedures for Student Appeals of Final Course Grades*, available online at legal.charlotte.edu/policies/up-410.

For guidelines on applying this policy, please visit University Policy 411, *Request for Review of a Final Course Grade Guidelines for Students*, online at legal.charlotte.edu/policies/up-411.

Students should follow the procedures outlined in that policy if they believe that the final course grade that has been assigned is incorrect. The policy encourages the student to discuss the grade with the instructor as soon as possible after the grade is received. Students should note, however, that the University is not obliged to respond to a grade appeal unless the student files it with the appropriate department chairperson or interdisciplinary program director within the first four weeks following the last day of the regular semester or the summer term in which the grade was received. When a grade is assigned consistent

with University policy, only the instructor has the right to change the grade except as provided in the Incomplete grade policy. When an instructor reports a grade change for a grade other than I, the Change of Grade request must be approved by their Department Chairperson and the Graduate School.

ACADEMIC STANDING

Requirements for Continued Enrollment

All graduate students whether degree seeking or non-degree seeking (post baccalaureate) must maintain satisfactory grades. In addition, students enrolled in any graduate program must maintain satisfactory progress toward the degree. Students are expected to achieve a commendable or satisfactory grade (A or B) in all coursework attempted for graduate credit. Students who fail to maintain satisfactory progress toward their degree or who do not achieve commendable or satisfactory grades in all their graduate coursework are subject to suspension and/or termination from their program of study and/or the Graduate School.

International students on F-1 or J-1 visa status must carry a full course load each academic semester (Some exceptions apply. See International Student/Scholar Office for further information.) Students who are suspended or terminated from their program of study are advised to consult the International Student/Scholar Office for information on maintaining valid F-1 or J-1 status, or reinstatement to valid F-1 or J-1 status.

Academic Suspension

All graduate students (degree/certificate seeking and post baccalaureate) are subject to academic suspension. An accumulation of three marginal C grades in any graduate coursework will result in suspension of the student's enrollment. If a student makes a grade of U in any graduate course, enrollment will be suspended. A graduate student whose enrollment has been suspended because of grades is ineligible to register in any Fall or Spring semester or Summer term unless properly reinstated through the appeal process.

Note: Some departments and/or programs have stricter regulations on suspension than those of the Graduate School. See the academic regulations presented in the program specific sections of this Catalog.

Appeal Procedure

Graduate students may appeal a suspension or termination using the procedures described in the following paragraphs. Other grievances relating to academic status are to be addressed to the Graduate School. For additional information on grievances, see University Policy

411, Student Grievance Procedure, online at legal.charlotte.edu/policies/up-411.

Appeal of Academic Suspension for the Purpose of Reinstatement

A student who has been suspended from the Graduate School and/or a program of study may appeal their suspension and must be reinstated in order to continue their studies. After notification of suspension is received, the student initiates the appeal procedure by submitting a Suspension Appeal Form, available through the online Graduate Academic Petition, to the Graduate Program Director of their academic program. Pending approval, the Graduate Program Director will provide a recommendation regarding reinstatement to the Graduate School. The Associate Dean for Enrollment Management makes the decision on the suspension appeal and notifies the student of the decision in writing.

A student readmitted to a graduate program through reinstatement will be expected to complete the degree program with satisfactory or commendable performance (A or B grades). Should a student receive a grade of C or U in a graduate course after being reinstated to the program, enrollment in the graduate program will be terminated.

A student who is denied readmission through the suspension appeal process is considered to be terminated from the Graduate School and/or the graduate program. Terminated students may appeal their termination as identified in the section entitled "Appeal of Academic Termination for the Purpose of Reinstatement."

Academic Termination of Non-Degree Seeking Students

Academic termination of non-degree seeking (post-baccalaureate) students may occur in two ways.

- 1) A student's graduate status will be terminated if, after receiving an initial suspension (see "Academic Suspension") and subsequent reinstatement (see "Appeal of Academic Suspension for the Purpose of Reinstatement"), the student receives a grade of C or U in a graduate-level course.
- 2) A student's graduate studies may be terminated if they fail to maintain the general standards of the Graduate School (e.g., accumulation of more than one C grade in a term resulting in a total of four or more C grades in their graduate academic record, three C grades and one U, or two or more U grades in a single term).
- 3) Students who are suspended from the Graduate School and are denied re-admittance through the

suspension appeal process (see "Appeal of Academic Suspension for the Purpose of Reinstatement") are considered terminated from the Graduate School.

Academic Termination of Degree/Certificate Seeking Students

Academic termination of a degree/certificate graduate student's program of studies may occur in four ways.

- 1) Students may be required to terminate their graduate studies if they fail to maintain satisfactory academic progress. One example of failure to maintain satisfactory academic progress is non-adherence to the schedule of "Time Limits for Degrees."

When a program determines that a student is making unsatisfactory progress, the program notifies the student in writing of the program's concern about the student's performance. Such a warning specifies the source of the concern, the applicable program and/or Graduate School rules, and the proposed action. Warnings specify when and on what basis a recommendation for academic termination will be considered by the program. A probationary period of one academic semester is normal.

Following the probationary period, a student who fails to meet the provisions of the warning is subject to termination from the program. If the program believes that termination is warranted, the graduate program director or coordinator communicates to the Associate Dean of the Graduate School in writing the specific reasons involved, all warnings communicated to the student, the program and/or advisory committee procedures and actions leading to the recommendation, and the mailing address of the student. After considering all of the information, the Associate Dean will make a decision. If the decision is to terminate, the Associate Dean will notify the student of their termination from the Graduate School.

- 2) A student's graduate studies may be terminated if they fail to maintain the specific standards of the student's academic program as described in the program specific sections of the *Graduate Catalog* (e.g., a doctoral program may indicate that the accumulation of two C grades or one U grade is grounds for termination from the program) or the general standards of the Graduate School for termination (e.g., accumulation of more than one C grade in a term resulting in a total of four or more C grades in their graduate academic record, three C grades and one U, or two or more U grades in a single term).

Note: A graduate student may be terminated without

prior suspension if they receive four C grades, regardless of the semester in which the grades were received.

- 3) A student's graduate studies will be terminated if, after receiving an initial suspension (see "Academic Suspension") and subsequent reinstatement (see "Appeal of Academic Suspension for the Purpose of Reinstatement"), the student receives a grade of C or U in a graduate level course.
- 4) Students who are suspended from a graduate program and are denied re-admittance through the suspension appeal process (see "Appeal of Academic Suspension for the Purpose of Reinstatement") are considered terminated from their graduate program.

Readmission of Terminated Graduate Students

Students who have been academically terminated from the Graduate School and/or a UNC Charlotte graduate program are not eligible for readmission as either a degree seeking or non-degree seeking graduate student. However, if **after two years** the student can demonstrate the potential for academic success and/or personal and professional development since leaving the University, the student may initiate a request for readmission to the Graduate School. The student may initiate the request for readmission to the program from which they were terminated, to a different graduate program, or as a post-baccalaureate student. Students seeking readmission must submit a new application package which includes the full set of materials identified in the section entitled "General Application Requirements for Admission." In addition, the student must include within their essay (Statement of Purpose) a section explaining the circumstances that led to their termination from the UNC Charlotte Graduate School and a discussion of the academic and/or personal and professional development since last attending the University that has prepared them for a successful return to graduate studies.

Appeal of Academic Termination for the Purpose of Reinstatement (Post-Baccalaureate Students)

While an action of termination is considered final, a post-baccalaureate student who is terminated may appeal that termination to the Graduate School if there are unusual or extenuating circumstances.

To initiate an Appeal of Academic Termination, the student must send a written letter to the Graduate School requesting consideration of their case by the UNC Charlotte Graduate School Appeals Committee. In the written request, the student must make their case for reinstatement. The student must include two letters from

UNC Charlotte faculty or academic administrative personnel who are knowledgeable of the student's academic capabilities and are supportive of the student's reinstatement to the Graduate School. A termination appeal request and the supporting documentation must be received by the Graduate School within 30 days of the date on the letter of termination.

Once the Graduate School receives the Appeal of Termination, it will be forwarded to the Chair of the Graduate School Appeals Committee. This Committee will review all relevant materials and make a recommendation to the Dean of the Graduate School. The Dean of the Graduate School makes the decision on the Appeal of Termination case and their decision is final.

Appeal of Academic Termination for the Purpose of Reinstatement (Degree-Seeking Students)

While an action of termination is considered final, a student who is terminated from a graduate program may appeal that termination to the Graduate School if there are unusual or extenuating circumstances. The type of academic termination will determine the permissible grounds for the appeal and the specific procedure utilized.

Category 1: Academic Termination Based on Failure to Maintain Commendable or Satisfactory Performance in Coursework

Category 1 appeals are available to students who have been terminated for receiving a U or C grade after an initial suspension and students who fail to maintain the specific grading standards of an academic program. In these cases, an Appeal of Academic Termination submitted to the Graduate School must be supported by the student's graduate program. Without support from the student's graduate program, academic termination of this type is always considered a final action.

To initiate a Category 1 Appeal of Academic Termination, the student must send a written letter to the Graduate School requesting consideration of their case by the UNC Charlotte Graduate School Appeals Committee. In the written request, the student must make their case for reinstatement. Included with the student's letter must be at least two letters of support for reinstatement from the student's academic program. For master's degree students, the termination appeal should include a letter from the program coordinator/director and a letter from the department chair, major advisor and/or the thesis/project advisor. For a doctoral student, a termination appeal should include a letter from the program coordinator/director and the advisory committee or dissertation committee chair. The letters from the program must specify what expectations must be met by the student if they are readmitted to the program. An appeal is not considered complete without letters of

support and will not be reviewed by the Appeals Committee. A termination appeal request and the supporting documentation must be received by the Graduate School within 60 days of the date on the letter of termination.

Once the Graduate School receives a Category 1 Appeal of Termination, it will be forwarded to the Chair of the Graduate School Appeals Committee. This Committee will review all relevant materials and make a recommendation to the Dean of the Graduate School. The Dean of the Graduate School makes the decision on the Appeal of Termination case and their decision is final.

Category 2: Academic Termination Based on Programmatic Action

Category 2 appeals are for students who have been terminated for failure to make satisfactory progress in an academic program and for students who have been denied re-admittance through the suspension and/or the Category 1 termination appeal process. Academic decisions based on the disciplinary expertise and judgment of graduate faculty members and program coordinators/directors in a particular field are not subject to appeal. The fact that a programmatic decision goes against a student's desire for continuation in an academic degree program is not grounds for a termination appeal. However, with program support, a doctoral student who was terminated for failing a milestone may appeal for immediate admission to the relevant master's program, provided they meet the outlined criteria for doing so. When moving to the master's program is not an option, a Category 2 appeal may be brought on the grounds that there was "procedural error" or "discrimination" in the termination decision.

To initiate a Category 2 Appeal of Academic Termination, the student must send a written letter to the Graduate School requesting consideration of their case by the UNC Charlotte Graduate School Appeals Committee. In the written request, the student must make their case for reinstatement. If the student is alleging "procedural error," the student must specify what procedures were utilized and how the program deviated from the specified procedures. If the basis of the appeal is "discrimination," the student must show how their case was handled substantially different from those of other students in similar circumstances. A termination appeal request and the supporting documentation must be received by the Graduate School within 60 days of the date on the letter of termination.

Once the Graduate School receives a Category 2 Appeal of Termination, it will be forwarded to the Chair of the Graduate School Appeals Committee. The Chair of the Appeals Committee will contact the program in question and request a response to allegations of "procedural error"

and/or "discrimination." The program will have two weeks to respond to the request of the Appeals Committee Chair. Once all relevant information had been received, the Committee will review the materials and make a recommendation to the Dean of the Graduate School. The Dean of the Graduate School makes the decision on the Appeal of Termination case and their decision is final.

Graduate School Appeals Committee

The Graduate School Appeals Committee is authorized to review appeals for reinstatement from graduate students who have been academically terminated. The Committee does not hear grade appeals, for which a separate procedure exists. The Appeals Committee is comprised of four members. The Associate Dean of the Graduate School serves as the ex officio, non-voting chair of the committee. The three voting members of the Appeals Committee are graduate faculty members named by the Dean of the Graduate School.

DISCIPLINARY SUSPENSION

Readmission is not automatic for graduate students suspended for disciplinary reasons. To be considered for readmission, a graduate student must reapply to the Graduate Admissions Office using the online application. An explanation of the circumstances surrounding any disciplinary suspension must be included in the Campus Safety section of the application for admission. Similarly, the applicant must meet all requirements established by the academic program and/or the University before readmission will be considered. (See the "UNC Charlotte Code of Student Responsibility" for a more complete discussion of disciplinary suspension.)

MASTER'S DEGREE REQUIREMENTS

Residence Requirements

No more than thirty percent (30%) of the total credit hours required will be accepted for transfer into a master's degree program. All other work must be residence credit.

Residence credit is credit that is earned under the conditions specified herein and may be applied toward the attainment of graduate degrees at UNC Charlotte. These conditions must be satisfied regardless of the location (on

campus, online, or distance) in which the course is given.

Instruction

The instructor must be a member of the UNC Charlotte Graduate Faculty.

Course(s)

The content of each course must be approved by regularly established college, Graduate School and University curricular processes before the course is scheduled or offered.

Residence credit may also be awarded by virtue of an examination administered by the Graduate Faculty of the department offering credit. A student may also, with the prior approval of the appropriate UNC Charlotte department and the Dean of the Graduate School, take graduate courses for residence and course credit at a college or university accredited by an accepted accrediting body.

Advisory Committee

All students in graduate programs must have a graduate advisor who is a regular member of the Graduate Faculty in the student's major program. The graduate advisor appointment must be approved by both the Graduate Program Director and the Graduate School. Students completing a master's thesis are required to establish an advisory committee, with the graduate advisor serving as chair or co-chair. Master's programs may choose to require an advisory committee in cases where a student is not completing a thesis, such as a master's project and/or final oral examinations.

In all situations requiring a committee, the committee will consist of at least three graduate faculty members, one of whom is designated as chair. For students completing a master's thesis, the appointment of the master's thesis committee form should be approved by the Graduate School prior to the student's proposal defense.

Program Approval

Each student's individual program of study must be approved by their department/college. A maximum of twenty percent (20%) of the total credit hours may be included in the approved program of study.

Minimum Hours and Quality

A student is expected to satisfactorily complete a minimum of 30 or more credit hours of approved graduate level courses, depending upon their individual program, with a GPA of 3.0 or above in courses on the degree plan of study. Grades in all courses attempted, whether or not on the plan of study, remain on the transcript and will be included in the calculation of the student's cumulative GPA as it is reported on the transcript. Courses graded as C on the degree plan of study must be

offset by an equal number of graduate-level credits graded as A. Some programs may have stricter requirements regarding the applicability of grades of C towards degree completion. Please reference the program-specific entries of this *Catalog*. Students and faculty should refer to the Academic Suspension and Termination policies in this *Catalog* regarding the accumulation of marginal grades of C.

Culminating Experience

The intent of graduate education is to provide exposure and training in a specific discipline, culminating in an independently researched comprehensive demonstration of a student's competence in the field. For both the Master of Arts (M.A.) and Master of Science (M.S.) degrees, the culminating experience is normally a thesis or written comprehensive examination. In some cases, M.A. or M.S. programs may substitute another culminating experience, such as an independent research project, internship, portfolio, or capstone course. Such substitutions must be formally approved through the graduate curriculum review process. Students must be enrolled during the semester in which they take the comprehensive examination or any other type of culminating experience.

A few graduate programs offer professional (non-research) master's degrees in designated fields. Most professional master's programs at UNC Charlotte require a culminating experience. In rare cases, a professional master's degree program may seek approval, via the graduate curriculum review process, to waive the culminating experience requirement provided the program can sufficiently demonstrate that this practice is consistent with the guidelines of its field and/or accreditation requirements. (*Note: The culminating experience requirement cannot be waived for individual students.*)

Comprehensive Assessment

The plan of study for a master's degree may or may not include a comprehensive assessment. Comprehensive assessments are administered written and/or orally by graduate program faculty. Students should refer to their program for the exam deadline. Students who fail a comprehensive assessment are subject to termination and should discuss options with their graduate program director. With program approval, a comprehensive assessment may be retaken one time. If the student fails the exam a second time, the program may, in rare circumstance and with compelling evidence, allow a student to, within four months, retake the exam (or portion of the exam). In such cases, the program must document the circumstances under which the student is allowed to retake portions of the exam and demonstrate that the student's committee unanimously supports the decision. Documentation must be submitted to the Graduate School for review prior to the exam date. In no instance will the student be allowed to take the exam (or portion

of the exam) a fourth time. Students may only appeal a termination to the Graduate School if their appeal to retake the exam is based on a procedural error or discrimination (please see the Category 2 appeal description under *Appeal for Academic Termination*) and their initial appeal to the program was denied.

Thesis

The plan of study for a master's degree may or may not include completion of a thesis. The thesis and non-thesis approaches are designed to meet the needs of students preparing for different types of careers and represent qualitatively different educational experiences. Consequently, the academic departments and the Dean of the Graduate School discourage any switching from one plan to another. Master's thesis credit can be graded using either the standard letter grade or SP/UP grade mode option, but must be graded each semester. If a switch from a thesis to non-thesis plan is approved, the student must submit a graduate academic petition to withdraw from the thesis credit. The grade for the thesis work will be changed to W on the transcript with no refund of tuition for the course(s). Students pursuing the thesis option must successfully defend a proposal of their thesis topic. It is expected that all thesis committee members be present for both the thesis proposal defense and for the thesis final defense. Upon successful defense of the proposal, students should submit the Proposal Defense for Doctoral Dissertation and/or Master's thesis form to the Graduate School. This form is available on the Graduate School website.

The thesis should be submitted for final approval by the student's thesis committee at least three weeks before the date of the oral examination in which the thesis is defended. Following the successful completion of this defense, the master's candidate must submit a copy of the approved and error-free thesis to the Graduate School (via ProQuest) no later than the filing date indicated in the University Calendar. Guidelines for the preparation of the thesis are available online on the Graduate School website under Current Students. Additionally, the student must submit the Defense Report for Doctoral Dissertation and/or Master's thesis form and the original thesis title page to the Graduate School (with original signatures).

As a research university, UNC Charlotte contributes to the scholarly community through the work of faculty and graduate students. Students are required to submit their dissertation or thesis to ProQuest, an online repository for scholarly work. Although the author of the work retains the copyright, open access may impact the likelihood of publication in some journals. More information is available at www.ProQuest.com.

Under certain circumstances, research may need to be temporarily withheld from publications or "embargoed."

Such restrictions may be requested when a:

- a) patent application is expected;
- b) publication has been submitted to a journal and the publisher's copyright excludes publication of the work in ProQuest. In this case, a screen shot of the journal policy must be included.
- c) contract with an outside entity, such as a government agency, requires that the research be embargoed temporarily.

To request an embargo of a dissertation or thesis, the student and the advisor must submit a request to the Graduate School, which will include supporting documentation. Embargoes may be requested for up to one year, after which time the document will be made available through ProQuest. In extraordinary circumstances, an extension to the embargo may be requested. This form is available on the Graduate School website under Current Students. Embargo requests should be submitted three weeks prior to the final defense date, when possible.

Time Limit

All requirements for the master's degree must be completed within seven (7) calendar years, beginning with the student's first term in the program. The time limit cannot be paused, even if the student takes an approved leave of absence. No course older than seven years may be applied towards a master's degree (including transfer credit). Any course that exceeds this limit must be retaken. Failure to adhere to the time limit may result in the termination of a student's enrollment.

The Graduate School may consider requests for a single extension of one (1) year in cases with rare, extenuating circumstances. In such cases, the student and graduate program must provide a signed timeline for program completion that does not exceed one year. Failure to adhere to the approved timeline for completion will result in automatic termination of the student's enrollment for a lack of satisfactory academic progress. Multiple extensions will not be approved.

Courses and Other Requirements

The courses and other requirements for specific degree programs are presented in each of their individual sections throughout this *Catalog*. Students are encouraged to review their individual DegreeWorks audit prior to registration to ensure they are making sufficient progress towards graduation.

Application for Degree

Students who are co-enrolled in a master's and doctoral program should be enrolled in both programs for two academic terms prior to graduation from either degree.

Students should submit the Online Graduation Application at the beginning of the term in which they anticipate completion of the master's program. Adherence to Graduate School deadlines is expected. Students are encouraged to review their individual DegreeWorks audit to ensure they have met all graduation requirements.

Students participate in the commencement ceremony at the end of the term in which they complete their degree and/or certificate requirements.

PH.D. DEGREE REQUIREMENTS

A doctoral degree is conferred by the University after the student has demonstrated outstanding scholarship in an approved program of study. Candidates must satisfy all University degree requirements in addition to all standards established by the doctoral faculty of their particular program. Specific program degree requirements are listed under the respective doctoral programs in this *Catalog*. In some cases, requirements in a given program are more stringent than the minimum requirements established by the Graduate School.

Ordinarily, a student must complete at least 72 post-baccalaureate credit hours in order to earn the Ph.D. In cases where a student has earned a master's degree in a relevant field from UNC Charlotte or another institution, the student may be permitted to pursue advanced standing within their Ph.D. program. Such advanced standing must be approved through the graduate curriculum review process and appear in the program-specific sections of this *Catalog*.

Advisory Committees

All students in graduate programs must have a graduate advisor who is a regular member of the Graduate Faculty in the student's major program. The advisor is typically the chair of the student's dissertation committee. When there is a compelling reason to do so, another faculty member may serve as "co-chair."

For doctoral students, the dissertation committee will consist of at least four Graduate Faculty members, one of whom is appointed by the Dean of the Graduate School as the Graduate Faculty representative. Dissertations are chaired by graduate faculty and are selected by agreement between the student and the faculty member.

The committee for doctoral students is indicated on the Appointment of Doctoral Dissertation Committee form (available in the Graduate School office or online). At the time that the Appointment of Doctoral Dissertation

Committee form is approved, the Graduate School appoints the Graduate Faculty Representative to serve on the doctoral committee.

Graduate Faculty Representative

The graduate faculty representative is a member of the doctoral student's advisory committee appointed by the Graduate School. Advisors may recommend to the Graduate School a faculty member who meets the relevant criteria (below). Recommendations should accompany the initial Committee form. The graduate faculty representative must assure that the doctoral student is treated fairly and impartially by their advisory committee, and assure that University standards and policies are upheld. For these reasons, faculty serving in this role should hold tenure and a Regular Graduate Faculty membership, have served on a dissertation or thesis committee prior to this appointment and come from a department different than the student and chair. This faculty member's role is primarily but not totally procedural. The faculty member may also participate in the development and evaluation of the student's research to the extent appropriate for the faculty member's background. The Graduate Faculty Representative is a full voting member of the committee. This representative is appointed prior to the student's dissertation proposal defense and must participate in the formation of the student's topic and in the final dissertation examination.

Advanced Standing Tracks for Doctoral Programs

Doctoral students who enter with a relevant master's degree may be admitted to an Advanced Standing track in some doctoral programs. In those programs offering this option, the Graduate Program Director must recommend admission to the Advanced Standing track for the term in which the student begins their graduate study. This accelerated track must consist of a minimum of 42 credit hours (including GRAD 8302, GRAD 8990, and 18 credit hours of research).

Note: Courses taken as part of the student's master's program will not be accepted for transfer credit in such cases. Graduate credit from other institutions may not be applied to Advanced Standing Tracks for doctoral programs.

Program of Study

Students pursuing a Ph.D. who are not enrolled in advanced standing are eligible to transfer a maximum of 30 credit hours from another institution. In situations where a student is pursuing a master's degree and a Ph.D. simultaneously at UNC Charlotte, up to 30 credit hours may be shared between the two programs, provided that the student completes the master's degree before or concurrently with the Ph.D. Only those courses

appropriate for the approved program and curriculum in which the student is enrolled may be transferred or shared. Appropriate courses should be determined by the student's supervisory committee and approved by the program director before the request is submitted to the Graduate School.

Students are expected to satisfactorily complete all required coursework with a GPA of 3.0 or above in courses on the degree plan of study. Grades in all courses attempted, whether or not on the plan of study, remain on the transcript and will be included in the calculation of the student's cumulative GPA as it is reported on the transcript. Courses graded as C on the degree plan of study must be offset by an equal number of graduate-level credits graded as A. Some programs may have stricter requirements regarding the applicability of grades of C towards degree completion. Please reference the program-specific entries of this *Catalog*. Students and faculty should refer to the Academic Suspension and Termination policies in this *Catalog* regarding the accumulation of marginal grades of C.

Time Limit

All requirements for the Ph.D. must be completed within nine (9) calendar years, beginning with the student's first term in the program. The time limit cannot be paused, even if the student takes an approved leave of absence. No course older than nine years may be applied towards a research doctoral degree (including transfer credit). Any course that exceeds this limit must be retaken. Failure to adhere to the time limit may result in the termination of a student's enrollment.

The Graduate School may consider requests for a single extension of one (1) year in cases with rare, extenuating circumstances. In such cases, the student and graduate program must provide a signed timeline for program completion that does not exceed one year. Failure to adhere to the approved timeline for completion will result in automatic termination of the student's enrollment for a lack of satisfactory academic progress. Multiple extensions will not be approved.

Residence

All doctoral students are required to complete a substantial residency requirement during which they have sustained contact with the graduate faculty. This requirement is specified in the program descriptions.

Qualifying Examination

Each student must complete a qualifying examination. Ordinarily students who enter a Ph.D. program directly from a baccalaureate program sit for this examination before the end of their third post-baccalaureate year in the program while students who enter a Ph.D. program from a

master's degree program take the examination before the end of their first year in the doctoral program. To sit for this examination, the student must have at least a 3.0 GPA and must have removed any conditions upon admission. Qualifying assessments are administered by graduate program faculty. Students who fail a qualifying assessment are subject to termination and should discuss options with their graduate program director. With program approval, a qualifying assessment may be retaken one time. If the student fails the exam a second time, the program may, in rare circumstance and with compelling evidence, allow a student to, within four months, retake the exam (or portion of the exam). In such cases, the program must document the circumstances under which the student is allowed to retake portions of the exam and demonstrate that the student's committee unanimously supports the decision. Documentation must be submitted to the Graduate School for review prior to the exam date. In no instance will the student be allowed to take the exam (or portion of the exam) a fourth time. Students may only appeal a termination to the Graduate School if their appeal to retake the exam is based on a procedural error or discrimination (please see the Category 2 appeal description under *Appeal for Academic Termination*) and their initial appeal to the program was denied.

Candidacy

The dissertation topic may be proposed after the student has passed the qualifying examination. The dissertation topic proposal must be defended at a meeting of the student's advisory/dissertation committee. A written dissertation proposal must be submitted to the advisory/dissertation committee at least two weeks prior to the scheduled defense. A doctoral student advances to candidacy after the dissertation proposal has been approved by the student's advisory/dissertation committee and the Graduate School. Results of the dissertation proposal defense should be submitted to the Graduate School via the Proposal Defense for Doctoral Dissertation and/or Master's thesis form directly after the defense. Candidacy must be achieved at least one term prior to the term of graduation.

Dissertation

The doctoral program of study must include 18 hours of research credit, including dissertation credit. The doctoral candidate must be continuously enrolled in dissertation credit hours (Also see: Student Responsibility - Continuous Registration) beginning with the semester after the dissertation topic proposal is approved until the semester of graduation.

It is expected that all dissertation committee members be present for the dissertation proposal defense and for the dissertation final defense. If there is an exceptional case in

which a committee member needs to participate in the proposal or final defense from a remote location, the student and all committee members must agree prior to the defense. Additionally, the student must ensure that the defense is open to the public.

The dissertation must be submitted for final review by the student's committee at least two weeks before the date of the final examination in which the dissertation is defended. Following the successful completion of this defense, the doctoral candidate must submit one electronic copy of the approved error-free manuscript to the Graduate School (via ProQuest) no later than the filing date indicated in the University calendar. Guidelines for the preparation of the dissertation are available online on the Graduate School website under Current Students. Each student must submit the Defense Report for Doctoral Dissertation and/or Master's thesis form, the Submission and ETD Signature form, and the original dissertation title page to the Graduate School (with original signatures).

The Graduate School requires publication of the dissertation through ProQuest, an online database of dissertations. The student is responsible for paying the optional copyrighting fees. Any other arrangements for publications of the dissertation must not interfere with publication through ProQuest. It may be appropriate for some students to restrict access to their dissertation temporarily (such as when a patent application is pending). In these cases, the student and their committee must submit an embargo request to the Graduate School explaining why restricted access is needed.

As a research university, UNC Charlotte contributes to the scholarly community through the work of faculty and graduate students. Students are required to submit their dissertation or thesis to ProQuest, an online repository for scholarly work. Although the author of the work retains the copyright, open access may impact the likelihood of publication in some journals. More information is available at www.ProQuest.com.

Under certain circumstances, research may need to be temporarily withheld from publications or "embargoed." Such restrictions may be requested when a:

- a) patent application is expected;
- b) publication has been submitted and the publisher's copyright excludes publication of the work in Proquest. In this case, a screen shot of the journal policy must be included.
- c) contract with an outside entity, such as a government agency, requires that the research be embargoed temporarily.

To request an embargo of a dissertation or thesis, the student and the advisor must submit a request to the

Graduate School, which will include supporting documentation. Embargoes may be requested for up to one year, after which time the document will be made available through ProQuest. In extraordinary circumstances, an extension to the embargo may be requested.

Final Examination

Each candidate must pass a final examination over the contents of the dissertation. Sometimes called the "dissertation defense" or the "dissertation oral," this meeting is open to all members of the University community and must be announced to campus. The announcement of the final defense can be uploaded by the advisor to the Graduate School website at least 10 days prior to the date and disseminated through the Academic Affairs listserv. The announcement of the dissertation defense should include identification of the student's full name, the date of the defense, the location of the defense, the time of the defense, the title of the dissertation, the name of the Chair of the dissertation committee, and a brief Abstract of the dissertation. **The defense constitutes the final exam for a doctoral student. The decision of the faculty advisory committee is final.** In the rare event of a split decision, typically the faculty come to an agreement as to whether the student defense is acceptable. It is the responsibility of the committee chair to work within their ability to resolve any impasse among committee members. If no resolution is feasible, then the chair should consult with the Graduate School. No student is permitted to take the final examination more than twice.

Application for Degree

Students who are co-enrolled in a master's and doctoral program should be enrolled in both programs for two academic terms prior to graduation from either degree. Students should submit the Online Graduation Application at the beginning of the term in which they anticipate defending their dissertation. Adherence to Graduate School deadlines is expected. Degree requirements are completed when students successfully defend their dissertation and file the final copy of the dissertation in the Graduate School. Students are encouraged to review their individual DegreeWorks audit to ensure they have met all graduation requirements.

Students participate in the commencement ceremony at the end of the term in which they complete their degree and/or certificate requirements.

DBA DEGREE REQUIREMENTS

The Doctor of Business Administration (D.B.A.) degree is conferred by the University after the student has successfully completed all requirements in an approved doctoral program of study in the College of Business. Specific program degree requirements are described in the College of Business section of this *Catalog*.

Program of Study

All credits for the DBA degree must be completed in-residence at UNC Charlotte. Students are expected to satisfactorily complete all required coursework with a GPA of 3.0 or above in courses on the degree plan of study. Grades in all courses attempted, whether or not on the plan of study, remain on the transcript and will be included in the calculation of the student's cumulative GPA as it is reported on the transcript. Courses graded as C on the degree plan of study must be offset by an equal number of graduate-level credits graded as A. Some programs may have stricter requirements regarding the applicability of grades of C towards degree completion. Please reference the program-specific entries of this *Catalog*. Students and faculty should refer to the Academic Suspension and Termination policies in this *Catalog* regarding the accumulation of marginal grades of C.

Time Limit

All requirements for the DBA must be completed within nine (9) calendar years, beginning with the student's first term in the program. The time limit cannot be paused, even if the student takes an approved leave of absence. No course older than nine years may be applied towards a research doctoral degree (including transfer credit). Any course that exceeds this limit must be retaken. Failure to adhere to the time limit may result in the termination of a student's enrollment.

The Graduate School may consider requests for a single extension of one (1) year in cases with rare, extenuating circumstances. In such cases, the student and graduate program must provide a signed timeline for program completion that does not exceed one year. Failure to adhere to the approved timeline for completion will result in automatic termination of the student's enrollment for a lack of satisfactory academic progress. Multiple extensions will not be approved.

Qualifying Assessment

Upon approval of the dissertation topic, the student begins to develop their research project. The student's

dissertation proposal serves as the primary component of the qualifying assessment for the DBA program. Students who fail a qualifying assessment are subject to termination and should discuss options with their graduate program director. With program approval, a qualifying assessment may be retaken one time. If the student fails the assessment a second time, the program may, in rare circumstance and with compelling evidence, allow a student to, within four months, retake the exam (or portion of the exam). In such cases, the program must document the circumstances under which the student is allowed to retake portions of the exam and demonstrate that the student's committee unanimously supports the decision. Documentation must be submitted to the Graduate School for review prior to the exam date. In no instance will the student be allowed to take the exam (or portion of the exam) a fourth time. Students may only appeal a termination to the Graduate School if their appeal to retake the exam is based on a procedural error or discrimination (see the Category 2 appeal description under *Appeal for Academic Termination*) and their initial appeal to the program was denied.

Admission to Candidacy Requirements

The dissertation topic may be proposed after students have completed the required coursework. The proposal defense serves as the qualifying exam. Students are recommended for admission to candidacy after their Advisory Committee and the Dean of the Graduate School approve the dissertation topic. A student may not achieve candidacy and graduate in the same term. Candidacy must be achieved at least one term prior to the term of graduation.

Dissertation

Students must complete and defend a dissertation based on a research program approved by the student's Dissertation Advisor and Advisory Committee which results in a high-quality, original, and substantial piece of research. Students must be continually enrolled in BDBA 8999 for dissertation research credit, beginning with the semester following completion of the qualifying assessment and continuing through the semester of their graduation. Defense of the dissertation is conducted in a final oral examination that is open to members of the University community. The announcement of the final defense can be uploaded by the advisor to the Graduate School website at least 10 days prior to the date and disseminated through the Academic Affairs listserv. The announcement of the dissertation defense should include identification of the student's full name, the date of the defense, the location of the defense, the time of the defense, the title of the dissertation, the name of the Chair of the dissertation committee, and a brief Abstract of the dissertation. The defense constitutes the final exam for a doctoral student. The decision of the faculty advisory

committee is final. In the rare event of a split decision, typically the faculty come to an agreement as to whether the student defense is acceptable. No student is permitted to take the final examination more than twice.

For doctoral students, the committee will consist of at least four Graduate Faculty members, one of whom is appointed by the Dean of the Graduate School as the Graduate Faculty Representative.

The committee for doctoral students is indicated on the Appointment of Doctoral Dissertation Committee form (available in the Graduate School office or online). At the time that the Appointment of Doctoral Dissertation Committee form is approved, the Graduate School appoints the Graduate Faculty Representative to serve on the doctoral committee.

It is expected that all dissertation committee members be present for the dissertation proposal defense and for the dissertation final defense. If there is an exceptional case in which a committee member needs to participate in the proposal or final defense from a remote location, the student and all committee members must agree prior to the defense. Additionally, the student must ensure that the defense is open to the public.

The dissertation must be submitted for final review by the student's committee at least two weeks before the date of the final examination in which the dissertation is defended. Following the successful completion of this defense, the doctoral candidate must submit one electronic copy of the approved error-free manuscript to the Graduate School (via ProQuest) no later than the filing date indicated in the University calendar. Guidelines for the preparation of the dissertation are online on the Graduate School website under Current Students. Each student must submit the Defense Report for Doctoral Dissertation and/or Master's thesis form, the Submission and ETD Signature form, and the original dissertation title page to the Graduate School (with original signatures).

The Graduate School requires publication of the dissertation through ProQuest, an online database of dissertations. The student is responsible for paying the optional copyrighting fees. Any other arrangements for publications of the dissertation must not interfere with publication through ProQuest. It may be appropriate for some students to restrict access to their dissertation temporarily (such as when a patent application is pending). In these cases, the student and their committee must submit an embargo request to the Graduate School explaining why restricted access is needed.

As a research university, UNC Charlotte contributes to the scholarly community through the work of faculty and graduate students. Students are required to submit their

dissertation or thesis to ProQuest, an online repository for scholarly work. Although the author of the work retains the copyright, open access may impact the likelihood of publication in some journals. More information is available at www.ProQuest.com.

Under certain circumstances, research may need to be temporarily withheld from publications or "embargoed." Such restrictions may be requested when a:

- a) patent application is expected;
- b) publication has been submitted and the publisher's copyright excludes publication of the work in Proquest. In this case, a screen shot of the journal policy must be included.
- c) contract with an outside entity, such as a government agency, requires that the research be embargoed temporarily.

To request an embargo of a dissertation or thesis, the student and the advisor must submit a request to the Graduate School, which will include supporting documentation. Embargoes may be requested for up to one year, after which time the document will be made available through ProQuest. In extraordinary circumstances, an extension to the embargo may be requested.

Graduate Faculty Representative

The graduate faculty representative is a member of the doctoral student's advisory committee appointed by the Graduate School. Advisors may recommend to the Graduate School a faculty member who meets the relevant criteria (below). Recommendations should accompany the initial Committee form. The graduate faculty representative must assure that the doctoral student is treated fairly and impartially by their advisory committee, and assure that University standards and policies are upheld. For these reasons, faculty serving in this role should hold tenure and a Regular Graduate Faculty membership, have served on a dissertation or thesis committee prior to this appointment and come from a department different than the student and chair. This faculty member's role is primarily but not totally procedural. The faculty member may also participate in the development and evaluation of the student's research to the extent appropriate for the faculty member's background. The Graduate Faculty Representative is a full voting member of the committee. This representative is appointed prior to the student's dissertation proposal defense and must participate in the formation of the student's topic and in the final dissertation examination.

Application for Degree

Students who are co-enrolled in a master's and doctoral program should be enrolled in both programs for two academic terms prior to graduation from either degree. Students should submit the Online Graduation Application at the beginning of the term in which they anticipate defending their dissertation. Adherence to Graduate School deadlines is expected. Degree requirements are completed when students successfully defend their dissertation and file the final copy of the dissertation in the Graduate School. Students are encouraged to review their individual DegreeWorks audit to ensure they have met all graduation requirements.

Students participate in the commencement ceremony at the end of the term in which they complete their degree and/or certificate requirements.

ED.D. DEGREE REQUIREMENTS

The Doctor of Education (Ed.D.) degree is conferred by the University after the student has successfully completed all requirements in an approved doctoral program of study in the College of Education. Specific program degree requirements are described in the College of Education section of this *Catalog*.

Program of Study

Although the maximum amount of credit past the master's degree that an Ed.D. student may count towards a doctorate is 9 credit hours, only educational administration courses approved by the program coordinator may be transferred. This rule applies whether the courses were taken at UNC Charlotte or elsewhere; however, no more than six hours taken when the student was in post-baccalaureate (non-degree seeking) status may be applied toward the doctoral degree.

Students are expected to satisfactorily complete all required coursework with a GPA of 3.0 or above in courses on the degree plan of study. Grades in all courses attempted, whether or not on the plan of study, remain on the transcript and will be included in the calculation of the student's cumulative GPA as it is reported on the transcript. Courses graded as C on the degree plan of study must be offset by an equal number of graduate-level credits graded as A. Some programs may have stricter requirements regarding the applicability of grades of C towards degree completion. Please reference the program-specific entries of this *Catalog*. Students and faculty should refer to the Academic Suspension and Termination policies in this *Catalog* regarding the

accumulation of marginal grades of C.

Time Limit

All requirements for the Ed.D. must be completed within nine (9) calendar years, beginning with the student's first term in the program. The time limit cannot be paused, even if the student takes an approved leave of absence. No course older than nine years may be applied towards a research doctoral degree (including transfer credit). Any course that exceeds this limit must be retaken. Failure to adhere to the time limit may result in the termination of a student's enrollment.

The Graduate School may consider requests for a single extension of one (1) year in cases with rare, extenuating circumstances. In such cases, the student and graduate program must provide a signed timeline for program completion that does not exceed one year. Failure to adhere to the approved timeline for completion will result in automatic termination of the student's enrollment for a lack of satisfactory academic progress. Multiple extensions will not be approved.

Qualifying Assessment

Students are required to successfully pass a written and oral examination. Qualifying assessments are administered by graduate program faculty. The examination is based upon the core areas of educational leadership, educational research, and instructional technology. Students who fail a qualifying assessment are subject to termination and should discuss options with their graduate program director. With program approval, a qualifying assessment may be retaken one time. If the student fails the exam a second time, the program may, in rare circumstance and with compelling evidence, allow a student to, within four months, retake the exam (or portion of the exam). In such case s, the program must document the circumstances under which the student is allowed to retake portions of the exam and demonstrate that the student's committee unanimously supports the decision. Documentation must be submitted to the Graduate School for review prior to the exam date. In no instance will the student be allowed to take the exam (or portion of the exam) a fourth time. Students may only appeal a termination to the Graduate School if their appeal to retake the exam is based on a procedural error or discrimination (please see the Category 2 appeal description under *Appeal for Academic Termination*) and their initial appeal to the program was denied.

Admission to Candidacy Requirements

Students are recommended for admission to candidacy after successfully completing the written and oral comprehensive examination. A student may not achieve candidacy and graduate in the same term. Candidacy must be achieved at least one term prior to the term of

graduation.

Dissertation

Students must complete and defend a dissertation focused on a specific problem or question relevant to K-12 or higher education organizations, administration, or leadership. Students must be continually enrolled in ADMN 8999 (3 credit hours; Fall, Spring, and Summer semesters) for dissertation research credit, beginning with the semester following completion of the qualifying assessment and continuing through the semester of their graduation. Defense of the dissertation is conducted in a final oral examination that is open to members of the University community. The announcement of the final defense can be uploaded by the advisor to the Graduate School website at least 10 days prior to the date and disseminated through the Academic Affairs listserv. The announcement of the dissertation defense should include identification of the student's full name, the date of the defense, the location of the defense, the time of the defense, the title of the dissertation, the name of the Chair of the dissertation committee, and a brief Abstract of the dissertation. The defense constitutes the final exam for a doctoral student. The decision of the faculty advisory committee is final. In the rare event of a split decision, typically the faculty come to an agreement as to whether the student defense is acceptable. No student is permitted to take the final examination more than twice.

For doctoral students, the committee will consist of at least four Graduate Faculty members, one of whom is appointed by the Dean of the Graduate School as the Graduate Faculty Representative.

The committee for doctoral students is indicated on the Appointment of Doctoral Dissertation Committee form (available in the Graduate School office or online). At the time that the Appointment of Doctoral Dissertation Committee form is approved, the Graduate School appoints the Graduate Faculty Representative to serve on the doctoral committee.

It is expected that all dissertation committee members be present for the dissertation proposal defense and for the dissertation final defense. If there is an exceptional case in which a committee member needs to participate in the proposal or final defense from a remote location, the student and all committee members must agree prior to the defense. Additionally, the student must ensure that the defense is open to the public.

The dissertation must be submitted for final review by the student's committee at least two weeks before the date of the final examination in which the dissertation is defended. Following the successful completion of this defense, the doctoral candidate must submit one electronic copy of the approved error-free manuscript to

the Graduate School (via ProQuest) no later than the filing date indicated in the University calendar. Guidelines for the preparation of the dissertation are available online on the Graduate School website under Current Students. Each student must submit the Defense Report for Doctoral Dissertation and/or Master's thesis form, the Submission and ETD Signature form, and the original dissertation title page to the Graduate School (with original signatures).

The Graduate School requires publication of the dissertation through ProQuest, an online database of dissertations. The student is responsible for paying the optional copyrighting fees. Any other arrangements for publications of the dissertation must not interfere with publication through ProQuest. It may be appropriate for some students to restrict access to their dissertation temporarily (such as when a patent application is pending). In these cases, the student and their committee must submit an embargo request to the Graduate School explaining why restricted access is needed.

As a research university, UNC Charlotte contributes to the scholarly community through the work of faculty and graduate students. Students are required to submit their dissertation or thesis to ProQuest, an online repository for scholarly work. Although the author of the work retains the copyright, open access may impact the likelihood of publication in some journals. More information is available at www.ProQuest.com.

Under certain circumstances, research may need to be temporarily withheld from publications or "embargoed." Such restrictions may be requested when a:

- a) patent application is expected;
- b) publication has been submitted and the publisher's copyright excludes publication of the work in Proquest. In this case, a screen shot of the journal policy must be included.
- c) contract with an outside entity, such as a government agency, requires that the research be embargoed temporarily.

To request an embargo of a dissertation or thesis, the student and the advisor must submit a request to the Graduate School, which will include supporting documentation. Embargoes may be requested for up to one year, after which time the document will be made available through ProQuest. In extraordinary circumstances, an extension to the embargo may be requested.

Graduate Faculty Representative

The graduate faculty representative is a member of the doctoral student's advisory committee appointed by the Graduate School. Advisors may recommend to the Graduate School a faculty member who meets the

relevant criteria (below). Recommendations should accompany the initial Committee form. The graduate faculty representative must assure that the doctoral student is treated fairly and impartially by their advisory committee, and assure that University standards and policies are upheld. For these reasons, faculty serving in this role should hold tenure and a Regular Graduate Faculty membership, have served on a dissertation or thesis committee prior to this appointment and come from a department different than the student and chair. This faculty member's role is primarily but not totally procedural. The faculty member may also participate in the development and evaluation of the student's research to the extent appropriate for the faculty member's background. The Graduate Faculty Representative is a full voting member of the committee. This representative is appointed prior to the student's dissertation proposal defense and must participate in the formation of the student's topic and in the final dissertation examination.

Application for Degree

Students who are co-enrolled in a master's and doctoral program should be enrolled in both programs for two academic terms prior to graduation from either degree. Students should submit the Online Graduation Application at the beginning of the term in which they anticipate defending their dissertation. Adherence to Graduate School deadlines is expected. Degree requirements are completed when students successfully defend their dissertation and file the final copy of the dissertation in the Graduate School. Students are encouraged to review their individual DegreeWorks audit to ensure they have met all graduation requirements.

Students participate in the commencement ceremony at the end of the term in which they complete their degree and/or certificate requirements.

DNP DEGREE REQUIREMENTS

The Doctor of Nursing Practice (DNP) degree is conferred by the University after the student has successfully completed all requirements in an approved doctoral program of study in the School of Nursing. Specific program degree requirements are described in the College of Health and Human Services section of this *Catalog*.

Program of Study

No more than 6 credit hours will be accepted for transfer into the DNP program. This rule applies whether the courses were taken at UNC Charlotte or elsewhere.

Eligibility of courses for transfer is determined jointly by the School of Nursing and the Graduate School.

Students are expected to satisfactorily complete all required coursework with a GPA of 3.0 or above in courses on the degree plan of study. Grades in all courses attempted, whether or not on the plan of study, remain on the transcript and will be included in the calculation of the student's cumulative GPA as it is reported on the transcript. Courses graded as C on the degree plan of study must be offset by an equal number of graduate-level credits graded as A. Some programs may have stricter requirements regarding the applicability of grades of C towards degree completion. Please reference the program-specific entries of this *Catalog*. Students and faculty should refer to the Academic Suspension and Termination policies in this *Catalog* regarding the accumulation of marginal grades of C.

Time Limit

All requirements for a professional doctoral degree (DNP) must be completed within six (6) calendar years, beginning with the student's first term in the program. The time limit cannot be paused, even if the student takes an approved leave of absence. No course older than six years may be applied towards a professional doctoral degree (including transfer credit). Any course that exceeds this limit must be retaken. Failure to adhere to the time limit may result in the termination of a student's enrollment.

The Graduate School may consider requests for a single extension of one (1) year in cases with rare, extenuating circumstances. In such cases, the student and graduate program must provide a signed timeline for program completion that does not exceed one year. Failure to adhere to the approved timeline for completion will result in automatic termination of the student's enrollment for a lack of satisfactory academic progress. Multiple extensions will not be approved.

Admission to Candidacy Requirements

Students are recommended for admission to candidacy after successfully completing the first project development course defense. A student may not achieve candidacy and graduate in the same term. Candidacy must be achieved at least one term prior to the term of graduation.

Scholarly Project

Students complete a DNP Scholarly Project in conjunction with their project development courses. The DNP Scholarly Project is a practice-focused quality improvement project that brings together the practice and scholarship aspects of the Doctor of Nursing Practice degree. It is designed to address complex practice issues that affect groups of patients or healthcare organizations. The clinical scholarship required in the DNP Scholarly

Project reflects mastery and competency in the student's area of expertise. The DNP Scholarly Project is completed through a four-course series spanning four semesters, culminating in a written and professional dissemination activity (defense). Defense of the Scholarly Project is conducted in a final oral examination to an audience, which can include a verbal or poster presentation to a professional meeting, a clinical organization, or to an audience of students and faculty.. The announcement of the final defense can be uploaded by the advisor to the Graduate School website at least 10 days prior to the date and disseminated through the Academic Affairs listserv. The defense constitutes the final exam for a doctoral student. The decision of the faculty advisory committee is final. In the rare event of a split decision, typically the faculty come to an agreement as to whether the student defense is acceptable. No student is permitted to take the final examination more than twice.

The DNP Scholarly Project is guided by the DNP Scholarly Project Advisory Committee. The composition of the DNP Scholarly Project Advisory Committee includes: 1) a chair who is a doctoral prepared faculty member with regular graduate faculty status at UNC Charlotte; 2) an expert doctoral prepared clinical mentor (Ph.D., DNP, M.D. or other doctoral prepared individual; and 3) one additional faculty member. It is the responsibility of the DNP Scholarly Project Advisory Committee to guide the student through project planning, implementation, and evaluation. The committee for doctoral students is indicated on the Appointment of Doctoral Dissertation and Scholarly Project Committee form (available online at the Graduate School's website).

The final defense of the Scholarly Project has two components: a written paper and a public professional presentation of the project. The professional presentation may take different forms but must be approved by the Advisory Committee Chair. The Scholarly Project written paper must be submitted for final review to the student's committee at least two weeks before the date of the final defense. Following the successful completion of this defense, the DNP student will submit one electronic copy of the approved error-free written paper to Atkins Library's Niner Commons no later than the filing date indicated in the University calendar. Guidelines for the preparation of the written scholarly project are available in the DNP Handbook. Each student must submit the Scholarly Project Completion Form to the Graduate School after a successful final defense.

As a research university, UNC Charlotte contributes to the scholarly community through the work of faculty and graduate students. DNP students are required to submit their scholarly projects to Atkins Library's Niner Commons, an online repository for scholarly work at UNC Charlotte. To deposit work in Niner Commons, an author must

maintain the right to publish in an institutional depository. Although the author of the work retains the copyright, open access may impact the likelihood of publication in some journals.

Under certain circumstances, research may need to be temporarily withheld from publications or "embargoed." Such restrictions may be requested when a:

- a) patent application is expected;
- b) publication has been submitted and the publisher's copyright excludes publication of the work in an institutional repository. In this case, a screen shot of the journal policy must be included.
- c) contract with an outside entity, such as a government agency, requires that the research be embargoed temporarily.

To request an embargo of a dissertation or thesis, the student and the advisor must submit a request to the Graduate School, which will include supporting documentation. Embargoes may be requested for up to one year, after which time the document will be made available through Niner Commons. In extraordinary circumstances, an extension to the embargo may be requested.

Application for Degree

Students should submit the Online Graduation Application at the beginning of the term in which they anticipate defending their dissertation. Adherence to Graduate School deadlines is expected. Degree requirements are completed when students successfully defend their Scholarly Project and file the final copy of the Scholarly Project in the Graduate School. Students are encouraged to review their individual DegreeWorks audit to ensure they have met all graduation requirements.

Students participate in the commencement ceremony at the end of the term in which they complete their degree and/or certificate requirements.

GRADUATE CERTIFICATE REQUIREMENTS

The graduate certificate is awarded for successful completion of a coherent program of at least 12 credit hours proposed by a unit of the graduate faculty and approved by the Graduate Council. Students are admitted to a particular graduate certificate program and are advised by faculty in the unit offering the graduate

certificate. Admission to a graduate certificate program is separate and distinct from admission to a graduate degree program. Admission to a certificate program is not an indication of subsequent admission to a degree program just as admission to a degree program is not an indication of admission to a certificate program.

Since the graduate certificate is not a degree, students may apply the credits earned in the certificate program toward a single degree that they pursue either in conjunction with the graduate certificate or after the certificate has been awarded. However, students may not apply credits earned in one certificate program toward the satisfaction of requirements in a second certificate program.

Students may enroll in a graduate certificate program only or may complete the certificate in conjunction with a graduate degree program at the University. Hours taken toward a graduate certificate may be counted toward a graduate degree program with the recommendation of the graduate program coordinator and the approval of the Graduate School.

Graduate certificate programs generally require at least 12 credit hours of graduate coursework and are held to the Transfer Credit policies outlined in the Registration section of the Graduate Catalog. The graduate certificate is awarded to a student who has completed the specified program of study with a GPA of 3.0 or above within five years from the time of enrollment in the first certificate course and has applied to graduate.

Students are expected to satisfactorily complete all required coursework with a GPA of 3.0 or above in courses on the certificate plan of study. Grades in all courses attempted, whether or not on the plan of study, remain on the transcript and will be included in the calculation of the student's cumulative GPA as it is reported on the transcript. Courses graded as C on the certificate plan of study must be offset by an equal number of graduate-level credits graded as A. Some programs may have stricter requirements regarding the applicability of grades of C towards degree completion. Please reference the program-specific entries of this *Catalog*. Students and faculty should refer to the Academic Suspension and Termination policies in this *Catalog* regarding the accumulation of marginal grades of C.

Time Limit

All requirements for the graduate certificate must be completed within five (5) calendar years, beginning with the student's first term in the program. The time limit cannot be paused, even if the student takes an approved leave of absence. No course older than five years may be applied towards a graduate certificate. Any course

that exceeds this limit must be retaken. Failure to adhere to the time limit may result in the termination of a student's enrollment.

The Graduate School may consider requests for a single extension of one (1) year in cases with rare, extenuating circumstances. In such cases, the student and graduate program must provide a signed timeline for program completion that does not exceed one year. Failure to adhere to the approved timeline for completion will result in automatic termination of the student's enrollment for a lack of satisfactory academic progress. Multiple extensions will not be approved.

Application for Certificate

Students should submit the Online Graduation Application at the beginning of the term in which they anticipate completion of the certificate program. Adherence to Graduate School deadlines is expected. Students are encouraged to review their individual DegreeWorks audit to ensure they have met all graduation requirements.

Students participate in the commencement ceremony at the end of the term in which they complete their degree and/or certificate requirements.

Note: No Graduate Certificates will be awarded retroactively.

ACADEMIC RECORDS AND TRANSCRIPTS

The Office of the Registrar is responsible for maintaining the official academic records for all students. Upon request by a student through Banner Self-Service, an official transcript of the academic record will be issued to the person or institution designated, provided that all the student's obligations to the University have been settled satisfactorily. For active students, transcripts can be ordered by logging in to my.charlotte.edu and selecting Banner Self Service. For former students who have been away for more than 12 months, transcripts can be ordered through the University's transcript provider, Parchment Exchange, at parchment.com/u/registration/39530834/institution.

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA) NOTIFICATION

A full explanation of FERPA rights and responsibilities at UNC Charlotte is found in the complete text of University Policy 402, Student Education Records (FERPA) at legal.charlotte.edu/policies/up-402, as that policy may be modified from time to time.

I. RIGHTS

In establishing University Policy 402, Student Education Records, UNC Charlotte adheres to a policy of compliance with the Family Educational Rights and Privacy Act of 1974, also known as FERPA, a federal law that affords students the following rights with respect to their education records:

A. To inspect and review the student's education records:

Students should submit to the Office of the Registrar, dean of their college, chair of their major academic department, or other appropriate official written requests that identify the record(s) they wish to inspect. The appropriate University official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.

B. To consent to disclosure of the student's education records to third parties, except to the extent that FERPA authorizes disclosure without consent, as follows:

1. Directory Information. Directory Information (as defined in Section I of University Policy 402), including the student's name; major field of study; dates of attendance; enrollment status; degrees and awards (including scholarships and distinctions) received; and county of residence for award, scholarship, or distinction recipients, may appear in public documents and may otherwise be disclosed without student consent unless a student submits a request form to the Registrar to withhold such information from disclosure. A request for non-disclosure will be honored by the University indefinitely, unless the student submits to the Registrar a written

revocation of such request for non-disclosure.

2. University Officials. University officials with legitimate educational interests in the student's education records are allowed access to student education records. A "legitimate educational interest" is defined as an interest that is essential to the general process of higher education, including teaching, research, public service, academic advising, general counseling, discipline, job placement, financial assistance, medical services, and academic assistance activities. University officials who may have access to only those education records in which they have legitimate educational interests include, but are not limited to, personnel in the following offices:

- Undergraduate Admissions
- Graduate Admissions
- Office of University Registrar
- Office of Undergraduate Education
- Financial Aid
- Financial Services
- Auxiliary Services
- Student Employment Office
- University Center for Academic Excellence
- Career Center
- Counseling Center
- Office of Adult Students and Extended Services
- Disability Services
- OneIT, for technical support associated with maintaining student education records only
- Internal Audit
- Office of Enrollment Management
- Office of Director of Athletics
- Office of Vice Chancellor for Student Affairs
- Office of Vice Chancellor for Business Affairs
- Office of Dean of Students
- Office of Dean of Graduate School
- Office of International Programs
- Offices of Chairpersons of Departments
- Offices of Deans of Colleges
- Offices of Directors of Interdisciplinary Units
- Office of Provost
- Office of Chancellor
- Office of Legal Affairs
- Campus Police, for internal law enforcement or health and safety purposes only
- University Advancement
- Teaching and Learning Connection
- Academic counselors and advisors
- Campus Behavioral Intervention Team
- Office of Institutional Research
- Faculty members
- Other academic and administrative personnel, as approved by the Chancellor

3. Parents of Dependents. Parents of a student who is a dependent for federal tax purposes, as defined by Section 152 of the Internal Revenue Code of 1954, may have access to that student's education records without prior consent of the student. Parents may demonstrate the tax dependency of a student only by submitting to the University a copy of the first and signature pages of their most recently filed federal income tax return (with personal financial data removed). Alternatively, a student may demonstrate tax dependency, and thus allow parental access to the student's records without prior consent of the student, by submitting to the University a signed statement of their tax dependency. If a dependent student's parents are divorced, both parents may have access to the student's records, so long as at least one parent claims the student as a dependent.

4. Other Institutions. The University may release a student's education records to officials of another school, school system, or institution of postsecondary education where the student seeks or intends to enroll, or where the student is already enrolled, so long as the disclosure is for purposes related to the student's enrollment or transfer.

5. Financial Aid. The University may release a student's education records to persons or organizations in connection with that student's application for, or receipt of, financial aid, but only to the extent necessary for such purposes as determining eligibility, amount, conditions, and enforcement of terms or conditions of such financial aid.

6. Accreditation Agencies. The University may release students' education records to accreditation organizations or agencies for purposes necessary to carry out their accreditation functions.

7. Judicial Orders. Information concerning a student shall be released in response to a judicial order or lawfully issued subpoena, subject to the conditions set forth in 34 CFR § 99.31(a)(9). The University will make reasonable efforts to notify the student of a subpoena before complying with it, except that the University shall not notify a student of a subpoena if it is from a federal grand jury or is for law enforcement purposes, and it provides that the University shall not disclose to any person the existence or contents of the subpoena or any information furnished in response to the subpoena.

8. Litigation. If the University initiates legal action against a parent or student, or if a parent or student initiates legal action against the University, the University may disclose to the court, without a court

order or subpoena, the education records of the student that are relevant for the University to proceed with the legal action as plaintiff or to defend itself in such legal action.

9. Health and Safety. The University may, subject to the conditions set forth in 34 CFR § 99.36, disclose student information to appropriate persons, including parents of a student, in connection with an emergency if knowledge of the information is necessary to protect the health or safety of the student or other individuals.

10. Student Conduct Hearing Results.

a. Disclosure to Victims: The University may disclose to an alleged victim of any crime of violence (as that term is defined in Chapter 1, Section 16 of Title 18, United States Code), or a non-forcible sex offense, the final results of any student conduct proceeding conducted by the University against the alleged perpetrator of such crime or offense with respect to such crime or offense, regardless of whether the alleged perpetrator was found responsible for violating the University's rules or policies with respect to such crime or offense.

b. Disclosure to Third Parties: The University may disclose the final results of any student conduct proceeding against a student who is an alleged perpetrator of any crime of violence or non-forcible sex offense (as those terms are defined in 34 C.F.R. 99.39), if the student is found responsible on or after October 7, 1998, for violating the University's rules or policies with respect to such crime or offense. Such disclosure shall include only the name of the student, the violation committed, and any sanction imposed by the University on that student. Such disclosure may include the name of any other student, such as a victim or witness, only with the written consent of that other student.

11. Alcohol and Drug Violations. The University may disclose to a parent or legal guardian of a student, information regarding any violation of any Federal, State, or local law, or of any rule or policy of the University, governing the use or possession of alcohol or a controlled substance, regardless of whether that information is contained in the student's education records, if the student is under the age of 21 at the time of disclosure to the parent, and the University determines that the student is responsible for a student conduct violation with respect to such use or possession.

12. Federal, State, and Local Officials and Educational Authorities. Subject to the requirements of 34 CFR § 99.35, the University may disclose education records to

authorized representatives of (i) The Comptroller General of the United States; (ii) The Attorney General of the United States; (iii) The Secretary; or (iv) State and local educational authorities.

13. Institutional Studies. The University may disclose education records, but only under the conditions set forth in 34 CFR § 99.31(a)(6), to organizations conducting studies for, or on behalf of, educational agencies or institutions to (A) Develop, validate, or administer predictive tests; (B) Administer student aid programs; or (C) Improve instruction.

14. Contractors. The University may disclose education records to a contractor, consultant, volunteer, or other party to whom the University has outsourced institutional services or functions, provided that the outside party:

- Performs an institutional service or function for which University would otherwise use employees;
- Is under the direct control of the University with respect to the use and maintenance of education records; and
- Is subject to the requirements of Section 99.33(a) governing the use and redisclosure of Personally Identifiable Information from education records.

15. Registered Sex Offenders. The University may disclose education records concerning sex offenders and other individuals required to register under Section 170101 of the Violent Crime Control and Law Enforcement Act of 1994, 42 U.S.C. 14071, if the information was provided to the University under 42 U.S.C. 14071 and applicable Federal guidelines.

C. To request amendment of the student's education records to ensure that they are not inaccurate or misleading:

A student who wishes to ask the University to amend a record should make a request to the University Registrar pursuant to the procedures in Attachment B to University Policy 402. The student should clearly identify the part of the record the student wants changed, and specify why it should be changed.

If the University decides not to amend the record as requested, the University will notify the student in writing of the decision and the student's right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

D. To be notified of the student's privacy rights under FERPA, as indicated by this Notification.

E. To file a complaint with the U.S. Department of Education concerning alleged failures by the University to comply with the requirements of FERPA. Complaints may be filed via email by completing the form at <https://studentprivacy.ed.gov/file-a-complaint> and emailing to FERPA.Complaints@ed.gov. Complaints may also be filed by mail at the following address:

U.S. Department of Education
Student Privacy Policy Office
400 Maryland Avenue, SW
Washington, DC 20202-8520

II. DEFINITIONS

"Directory Information" means information in a student's education record that would not generally be considered harmful or an invasion of privacy if disclosed. At UNC Charlotte, directory information consists of the student's name, major field of study, dates of attendance, enrollment status, degrees and awards (including scholarships and distinctions) received and county of residence for award, scholarship, or distinction recipients.

Photographs, videos, or other media containing a student's image or likeness (collectively, "student images") and University-issued student electronic mail addresses ("email addresses") are designated by UNC Charlotte as "Limited Use Directory Information." Use and disclosure of Limited Use Directory Information will be restricted to:

1. publication in official University publications or on social media sites or websites hosted or maintained by, on behalf of, or for the benefit of the University, including the University's online directory and internal email system;
2. University officials who have access, consistent with FERPA, to such information and only in conjunction with a legitimate educational interest; and
3. external parties contractually affiliated with the University, provided such affiliation requires the sharing of Limited Use Directory Information.

In addition, the following shall be considered Limited Use Directory Information that may be disclosed only to other students enrolled in the same course (regardless of whether such students are enrolled in the same class section or break-out group) that has been audio or video recorded by the University, for instructional and educational purposes only:

1. name, to the extent it is referenced or captured during the audio or video recording;

2. any photograph or image of the student captured during the audio or video recording;
3. any audio or video recording of the student participating in the course; and
4. any online chats or other recorded communications among participants in the course captured during the audio or video recording.

A student who requests to withhold this Limited Use Directory Information from disclosure pursuant to Section II.B.1 of University Policy 402 may limit the extent to which they will be able to participate in the course.

To protect the privacy of other students, students are not permitted to make their own recordings of class sessions or to share or distribute University recordings of class sessions.

“Education Records” include records directly related to a student that are maintained by UNC Charlotte. Education records **do not** include:

1. Records of instructional, administrative, and educational personnel that are in the sole possession of the maker (i.e. file notes of conversations), are used only as a personal memory aid, and are not accessible or revealed to any individual except a temporary substitute;
2. Records of the UNC Charlotte campus police;
3. Student medical and counseling records created, maintained, and used only in connection with provision of medical treatment or counseling to the student, that are not disclosed to anyone other than the individuals providing the treatment. (While a student may not inspect their medical records, these records may be reviewed by a physician of the student’s choice);
4. Employment records unrelated to the student’s status as a student;
5. Records created or received by an educational agency or institution after an individual is no longer a student in attendance, and that are not directly related to the individual’s attendance as a student;
6. Grades on peer-graded papers before they are collected and recorded by a teacher.

“Personally Identifiable Information” includes, but is not limited to:

- The student’s name;
- The name of the student’s parent or other family members;
- The address of the student or student’s family;
- A personal identifier, such as the student’s social security number, student identification number, or biometric record;

- Other indirect identifiers, such as the student’s date of birth, place of birth, and mother’s maiden name;
- Other information that, alone or in combination, is linked or linkable to a specific student that would allow a reasonable person in the school community, who does not have personal knowledge of the relevant circumstances, to identify the student with reasonable certainty; or
- Information requested by a person who the University reasonably believes knows the identity of the student to whom the education record relates.

“Student” means an individual who is or who has been in attendance at UNC Charlotte. It does not include persons who have been admitted but did not attend the University. For the purposes of this policy, “attendance” includes attendance in person or by paper correspondence, videoconference, satellite, Internet, or other electronic information and telecommunications technologies for students who are not physically present in the classroom; and the period during which a person is working under a UNC Charlotte work-study program.

III. COMPLIANCE

UNC Charlotte intends to comply fully with these requirements. [University Policy 402, Student Records](#), explains the procedures for compliance. Students may obtain copies of the policy in the Office of the Registrar or online at legal.charlotte.edu/policies/up-402. That policy includes a list of the locations of all education records maintained by the institution.

All questions concerning this FERPA Annual Notification may be directed to the attention of the [Office of the Registrar](#).

State Authorization Reciprocity Agreements (SARA)

Every state has the authority to regulate which postsecondary institutions offer education within its boundaries, including online programs and courses. The need to seek state authorization for online learning depends on a combination of each state’s laws and the activities that a course, program, or institution is conducting in that state.

UNC Charlotte participates in the national State Authorization Reciprocity Agreements (SARA, see additional information below) and is, therefore, authorized to offer online programs and courses in all its member states and territories. Details on state authorization at UNC Charlotte can be found on the School of Professional Studies State Authorization page (<https://professional.charlotte.edu/state-authorization/>).

SARA Complaint Resolution Procedures: UNC Charlotte

UNC Charlotte's State Authorization Student Complaint Resolution Procedures can be found on the School of Professional Studies State Authorization page (<https://professional.charlotte.edu/state-authorization/complaint-resolution/>). With all student complaints, students are advised to put their concerns in writing and carefully document the events that led to the complaint or grievance. Concerns should be expressed as soon as possible after the event occurs; some of the procedures have specific deadlines for filing grievances or complaints.

The Student Assistance and Support Services (SASS) unit in the Dean of Students Office (<https://sass.charlotte.edu/>) can provide guidance about grievances and appropriate avenues to express concerns about University experiences. If a complaint cannot be resolved to the student's satisfaction through the institution's complaint process, students may file a complaint with the North Carolina Post-Secondary Education Complaints unit (<https://www.northcarolina.edu/post-secondary-education-complaints/>).

If the complaint is not resolved to the student's satisfaction after completing the above steps AND the complaint pertains to online/distance education, students may also file a complaint through SARA North Carolina (SARA-NC) (<https://www2.ncseaa.edu/saranc/index.html>), or in the state in which they reside (if residing outside North Carolina). Please note: SARA North Carolina does not accept complaints regarding grades or student conduct violations.

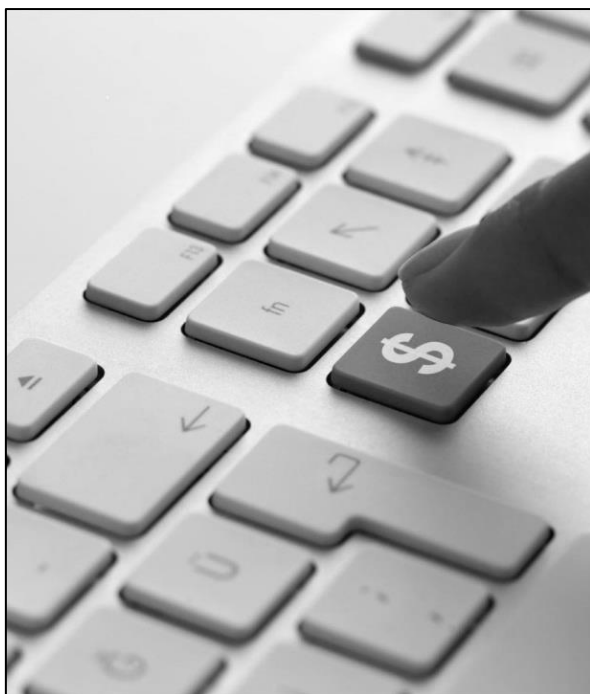
Students may also file a complaint with UNC Charlotte's regional accrediting agency, the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) (<https://www.sacscoc.org>).

SARA Student Complaint Process

Section 4.5 of the NC-SARA Policy Manual also provides complaint resolution procedures. To access these procedures, please visit <https://nc-sara.org/resources/sara-policy-manual-242>. Generally, complaints against an institution operating under SARA policies go first through the institution's own procedures for resolution of grievances.

If a person bringing a complaint is not satisfied with the outcome of the institutional process for handling complaints, the complaint (except for complaints about grades or student conduct violations) may be appealed, within two years of the incident about which the complaint is made. The resolution of the complaint by the institution's home state SARA State Portal Entity, through its SARA complaint resolution process, will generally be final.

While final resolution of complaints (for purposes of adjudication of the complaint and enforcement of any resultant remedies or redress) resides in certain cases with institutions (complaints about grades or student conduct violations), or more generally with the relevant institution's home state SARA State Portal Entity (all other complaints), the regional compact(s) administering SARA may consider a disputed complaint as a "case file" if concerns are raised against a SARA member state with regard to whether that state is abiding by SARA policies.



Financial Information

ninercentral.charlotte.edu

GRADUATE TUITION AND FEES

UNC Charlotte is a publicly supported institution and primarily receives its revenue from the State of NC appropriations, in addition to tuition and fees. It is the combination of tuition and fees that primarily supports the operations and expansion of UNC Charlotte. Tuition and fees are approved by the Student Representatives, UNC Charlotte Board of Trustees, and the UNC Board of Governors. Tuition rates are also approved by the NC General Assembly. These fees are mandatory to every student and cannot be waived.

Tuition and fees are billed by credit hour for Fall, Spring, and Summer terms. 12 or more credit hours are considered full-time for undergraduate students, and 9 or more credit hours are considered full-time for graduate students.

Charges for tuition and fees vary according to the student's status as a resident or non-resident of North Carolina. A non-resident student pays a higher rate of tuition than a legal resident. For more details, see the heading for *Residence Status for Tuition Purposes* later in this section.

For a complete list of current tuition and fees, visit <https://ninercentral.charlotte.edu/billing-payments-refunds/tuition-and-fees/>.

Graduate Tuition Increment

In addition to the tuition listed on the website above, there is an additional per term charge that is assessed to all students in specific graduate programs. See the Niner Central website at ninercentral.charlotte.edu/billing-payments-refunds/tuition-and-fees/graduate-tuition-fees for a list of applicable graduate programs and the cost of the increment.

The University reserves the right, with the approval of proper authorities, to make changes in tuition and fees at any time. The University also reserves the right to correct any clerical errors on a student's account. For the most current listing of tuition and fees at The University of North Carolina at Charlotte, see ninercentral.charlotte.edu.

Residence Status for Tuition Purposes

Tuition charges are based upon classification of a student as a resident or a non-resident of North Carolina for tuition purposes. The North Carolina Residency Determination Service (RDS), the sole authority for residency determinations, shall determine whether a student is a resident or non-resident for tuition purposes.

Residency Application Procedure

A new, incoming, or current student who wishes to request a residency classification will apply using the Residency

Determination Service (RDS). RDS is the entity responsible for all new classifications of residency in North Carolina. To begin the process, visit www.NCresidency.org. ALL student inquiries about initial determinations, reconsiderations, or appeals, should be directed to RDS. Students may contact RDS at 844-319-3640 or rdsinfo@ncresidency.org.

Appeal Procedure

A new, incoming, or current student who has exhausted the residency application procedure and has been classified as a non-resident for tuition purposes, may request further consideration of that decision to the Residency Determination Service (RDS). RDS is the entity responsible for all classifications of residency in North Carolina. ALL student inquiries about initial determinations, reconsiderations or appeals, should be directed to RDS. Students may contact RDS at 844-319-3640 or rdsinfo@ncresidency.org.

Required Fees

The required fees included in the Tuition and Fees table above are explained below.

49er ID Access Fee

This fee supports the University's 49er ID operations and support. The ID is not only used for identification purposes, but also as a library card and as a campus card for dining and vending purchases. This fee does not cover the replacement of a lost or stolen card.

Ed and Tech Fee

This fee is directly related to the infrastructure supporting student technology needs across campus including hardware and software applications, supplies for educational materials, web services, laboratory expenses and equipment, public student computing labs, central email and Internet services, training classes and classrooms, and central help desk services.

Food Service Facilities Fee

This fee provides funds to support year-round access, maintenance, repairs, and operation of campus dining facilities.

Health Services Fee

This fee funds health and counseling services for students, which includes the operations of the Student Health Center, the Center for Counseling and Psychological Services, and the Center for Wellness Promotion.

Niner Course Pack Fee

This fee funds the Niner Course Pack for students, which provides textbook rental course materials to students who

remain opted in the program. Students who wish to remove this fee must opt out of the program by the posted deadline each semester.

Safety and Security Fee

This fee provides funding for several of the recommendations made by the UNC Board of Governors' 2013-14 UNC [system-wide] Campus Security Initiative report which include, but are not limited to: (1) campus police officer and telecommunicator compensation; (2) highly qualified and trained investigators and hearing officers for reports of serious offenses, such as sexual violence; (3) Title IX and Clery Act compliance coordination; (4) substance abuse counselors, case managers, and/or other counseling staff; and (5) system-level safety and security training, coordination, and audit functions. The fee may also provide funding to meet some additional campus-specific safety and security needs consistent with the report's recommendations. The structure for this fee allows \$26 of the \$30 collected from each student per academic year to fund campus level and shared-services activities, while \$4 of the \$30 is allocated by the UNC General Administration for system-wide coordination, trainings, and other shared services functions.

Transportation Service Fee

This charge supports funding for Niner Transit (campus shuttle system), the Niner Paratransit service, and the CATS Access Pass. The services provide UNC Charlotte with efficient and safe campus transportation, reduce vehicular congestion, and decrease the demand for proximity parking.

UNC System Student Association Fee

This fee is a University of NC system-wide fee charged to all system students to support the University Of North Carolina Association of Student Governments. This association is a student led advocacy group whose main purpose is to ensure that the benefits of the University of North Carolina are extended to the people of North Carolina, as far as practicable, free of expense.

University Fee

This is a consolidated fee that relates to University debt service payments (to construct new facilities and purchase administrative computing systems) and to support other activities/operations including Athletics programs and events, Student Activity Center operations, and Cone University Center operations. The following fees are consolidated into the University Fee:

- *Athletics* - Funds intercollegiate athletics, including salaries and maintenance and operation of athletic facilities.
- *Student Activities* - Funds non-academic student services (student unions, intramural facilities, student

organizations, newspapers, yearbooks, and entertainment programs).

- *Debt Service* - Funds the principal and interest for capital projects. Examples for UNC Charlotte include the Student Union, Football Stadium, and Student Activity Facility.

Special Fees

The following additional course fees are charged to cover the cost of supplies or special materials:

ADDITIONAL COURSE FEES FOR GRADUATE STUDENTS (PER SEMESTER)	
Course	Fee
GRAD 7999 - Certificate/Master's Graduate Residency (Resident)	\$240.94
GRAD 7999 - Certificate/Master's Graduate Residency (Non-Resident)	\$1026.70
GRAD 9999 - Doctoral Graduate Residency (Resident)	\$240.94
GRAD 9999 - Doctoral Graduate Residency (Non-Resident)	\$1026.70

Application Fee

Domestic applicants must pay a \$75 application fee, international applicants a \$85 application fee, and post-baccalaureate applicants a \$25 application fee (each semester) when they apply for admission. The fee is nondeductible and nonrefundable.

Credit by Examination Fee

A written examination for a course requires a fee of \$15. A laboratory examination requiring the arrangement of such things as laboratory materials will require a fee of \$25. A combination of a laboratory and written examination will require a fee of \$30.

Matriculation Fee

Instead of paying separate fees for such things as new student convocation, commencement, and hardcopy academic transcripts, UNC Charlotte students pay a matriculation fee and receive these and other services at no charge. Students are charged the \$150 matriculation fee upon entry into a baccalaureate, graduate certificate/master's, and doctoral program at UNC Charlotte.

DINING, HOUSING,
AND PARKING

Dining and Meal Plans

Meal Plans, the 49er Account, and the Optional Dining Account all reside on the UNC Charlotte 49er ID.

For dining locations, menus, meal plans, and meal plan Policies, visit aux.charlotte.edu/meal-plans.

Housing

Semester rates for housing at UNC Charlotte. Rates include rent, utilities (including internet, cable, and laundry) and membership in the Resident Students Association (RSA). Prices and plans are subject to change. Housing types are based on availability. Current pricing can be found online at housing.charlotte.edu/apply/rates.

Admission to UNC Charlotte does not guarantee residence hall space. Arrangements for on-campus housing are made, after admission, with the Office of Housing and Residence Life. Shared Residence Hall space is not available to spouses or children of enrolled students.

Housing Deposit

A \$200 deposit must be submitted with all housing contracts. The deposit is not applied toward payment of fees. It is refunded only after the student has left on-campus housing and only if the student has met all financial obligations to the University. In the case of contract cancellation, the date of receipt of the written request for cancellation will determine, in part, the student's financial obligation to the University (please see the Housing Contract for the current academic year for specific terms and cancellation dates).

Parking

Students attending UNC Charlotte (and faculty and staff) are required to register their motor vehicle(s) in order to park on campus. Vehicle registration and virtual permit purchase is available online. **Virtual permits are required at all times when parked on campus, unless parked in a visitor parking area.** For students, two categories of virtual permits are issued: *Resident*, for students living on-campus, and *Commuter*, for students living off-campus. Lot-specific discounted permits are available on a first-come, first-served basis.

The current annual rate for a resident or full-time commuter student is \$480. Please see pats.charlotte.edu for a complete list of fees, permit information, and where each type of permit allows you to park. Full-time virtual permits are valid from August 1 of one year through August 14 of the following year. Semester permits are available for those graduating in December or wish to only purchase one semester at a time.

Discount remote lot and night permits are also available to commuters. Night permits are valid only after 3 p.m. Parking before 3 p.m. requires parking and payment in a visitor space.

The primary factor determining permit prices is the cost of new deck construction and replacing flat lots with decks. Neither tuition dollars nor state funds are used toward parking facilities; therefore, parking fees must pay for the construction and maintenance of all decks, lots, and associated operations.

Penalties for Parking Violations

- Parking and Traffic regulations are enforced 24 hours a day, seven days a week. Currently, permits are enforced at all times, and meters are enforced from 5 a.m. on Monday through 10 p.m. on Friday.
- Violators of University parking regulations are subject to penalties ranging from \$20 to \$480, depending on the severity of the violation.
- If a citation is not paid or appealed within ten (10) business days, the penalty will be applied to the student's University account. Subsequent registration may be withheld for non-payment.
- Copies of parking regulations and the citation penalty list are posted on the PaTS website.

The Parking and Transportation Services website, pats.charlotte.edu, has current UNC Charlotte parking ordinances, parking policy information, virtual permit and citation FAQs. It is also a source for transportation information, updates, and changes or disruptions to campus parking and transportation.

Questions concerning parking on campus should be directed to Parking and Transportation Services Communications Center at 704-687-0161; open 24 hours weekdays, 5 a.m. Monday through 10 p.m. Friday, except on holidays when the University is closed. Office hours are 8 a.m. to 5 p.m., Monday-Friday. Emergency situations and questions at other times should be directed to the Campus Police at 704-687-2200.

FUNDING A GRADUATE EDUCATION

Graduate School Funding

Financial support for UNC Charlotte graduate students is provided in the form of fellowships, tuition awards, and assistantships. The majority of full-time enrolled Ph.D. students receive funding, and approximately 15% of master's and certificate students receive some form of funding. Domestic students may also receive some type of federal financial aid to support their studies while enrolled at least half-time (see Financial Aid Programs below).

Nominations for funding are made by the Graduate Program Director, so students should communicate with the Director about the availability of funding support. While some programs provide all or the majority of their students with a graduate assistantship, others provide only limited support.

Graduate Assistant Support Plan (GASP)

The Graduate Assistant Support Plan (GASP) is a competitive multi-year support package used to attract and retain top quality doctoral students to UNC Charlotte. Students enrolled in this plan are eligible to receive full payment of in-state tuition, non-resident tuition (if required), and money for the student health insurance plan. To be eligible, a student must be a doctoral student who holds a graduate assistantship or appropriate fellowship meeting the minimum stipend and must be enrolled full-time (at least 9 credit hours, GRAD 9800 or GRAD 9999) for the first eight terms of support. In the final academic year of eligibility, GASP will pay for 3 credit hours of GRAD 9800. Students in Advanced Standing doctoral programs are eligible for a total of eight semesters of GASP. Students must be nominated by their Graduate Program Director and approved for the award by the Graduate School. Offers are contingent on the availability of funds.

Master's TA Resident Tuition (MTART)

Master's students holding a TA, 20 hours/week, with a \$7,000 or higher stipend, will be offered funding in the amount of 9 hours at the NC resident rate. Nonresident students will be billed an additional amount. Students must enroll in 9 hours to obtain the funding. Offers are contingent on the availability of funds.

Graduate School Grants

The Graduate School provides partial tuition support to students in master's programs via Graduate School Grants. Graduate School Grants are \$3,000/academic year and are

awarded to master's students on an annual basis and upon recommendation of the Graduate Program Director and approval of the Graduate School. Students can be enrolled in 3 or more credit hours to be eligible.

Grant Assistance (TAG)

The Tuition Assistance Grant is administered by the Office of Student Financial Aid and the Graduate School. It provides up to \$3,000 in grant assistance to students demonstrating financial need regardless of state residency. Eligible students are awarded these grants until funds are exhausted. Generally, these awards are made to eligible students upon nomination for funding for other Graduate School awards.

Assistantships and Employment

The majority of graduate assistantships at UNC Charlotte are awarded by academic departments. Many graduate students seek teaching or research assistantships as a way of both gaining valuable experience and securing financial support. Students may also choose from a variety of on- or off-campus employment opportunities in the Charlotte region, and are also frequently hired as student temporary employees for administrative work on campus.

Student temporary jobs are listed on Hire-A-Niner at hireaniner.charlotte.edu.

Graduate Assistantships

With graduate assistantships, students can gain valuable knowledge and experience related to their degree program by fulfilling teaching and research roles within the University. Stipends, responsibilities, selection criteria, and application and notification procedures vary from department to department, so students should contact their Graduate Program Director for additional information on available assistantships.

Graduate Students may be assigned as Teaching Assistants (TAs), however, only graduate students with at least 18 credit hours in the discipline may serve as a primary instructor of record (IORs).

On-Campus Employment

The Office of Student Employment assists students in obtaining Federal Work Study and temporary student worker positions within the University. Visit the Human Resources website at hr.charlotte.edu/students for more information. Hire-A-Niner also lists on-campus positions available for graduate students. Visit <https://hireaniner.charlotte.edu/>.

Off-Campus Employment

The University Career Center (UCC) operates a database

called Hire-A-Niner, which offers part-time and full-time employment opportunities. Detailed information about the services offered within the UCC can be found on their website at career.charlotte.edu.

Financial Aid Programs

The Office of Student Financial Aid administers several federal, state, and institutional financial aid programs available to graduate students at UNC Charlotte who complete a Free Application for Federal Student Aid (FAFSA). The FAFSA helps U.S. citizens and eligible non-citizens gain access to gift aid (repayment not required) such as grants or self-help aid (direct repayment or service required), like loans and Federal Work Study awards.

Applying for Federal and State Aid

The FAFSA can be completed from the Office of Student Financial Aid website, or directly at www.fafsa.ed.gov. The federal school code for UNC Charlotte is 002975.

Deadlines

The Office of Student Financial Aid must receive completed FAFSA forms by January 1 for grant assistance consideration for the following academic year. For loan assistance, there is no deadline, provided that the FAFSA is received by the Financial Aid Office to allow sufficient processing time prior to the end of the academic year (usually three to four weeks).

Forgivable Education Loans for Service (FELS)

The Forgivable Education Loans for Service Program was established by the North Carolina Assembly to provide assistance to qualified students who are committed to working in North Carolina in designated critical employment shortage professions. For information on deadlines, eligibility, value, and application procedure, visit www.cfnc.org/FELS.

Loan Assistance

Most graduate students may borrow up to the maximum loan limit annually from the Federal Direct Stafford Loan Program. That amount is \$20,500. Unlike loans for undergraduate students, only Unsubsidized Stafford loans are available to graduate students. "Unsubsidized" means that interest will begin to accrue on the loan once it is disbursed to the student's account. Students have the option of either paying the interest while enrolled in school at least half-time (5 credit hours for graduate students) or having the interest added to the loan principal. For summer enrollment, three hours counts as half-time. Loan repayment begins six months after the student graduates or ceases to be enrolled at least half-time.

In addition to Federal Direct Loans, graduate students may borrow funds through the federal Graduate PLUS loan program. Each student's maximum loan amount (combining all loan sources) is limited to the student's total Cost of Attendance minus any other aid received. More detailed information on the Cost of Attendance can be found on the Niner Central website at ninercentral.charlotte.edu.

Private Loans

Loans are also available for domestic and international students through private lenders. Visit the Niner Central website at ninercentral.charlotte.edu to view and compare a list of alternative loan lenders.

Donor-Funded Fellowships and Scholarships

UNC Charlotte provides graduate students the opportunity to apply for need-based and merit-based fellowships and scholarships. Eligibility varies by opportunity as by the individual donor or donors who fund the award. Scholarships can be used to offset tuition, room and board, books, or study abroad experiences, and do not have to be repaid.

NinerScholars Portal

The NinerScholars Portal serves as the common application system for all scholarships offered by a college, department, office, or program at UNC Charlotte. NinerScholars uses the University's student information system to build a scholarship profile specific to each student's academic history and current status. The Portal then compares a student's profile to the criteria for each UNC Charlotte scholarship, matches them with those scholarships they are eligible for, and provides the student with the ability to apply for multiple opportunities with a student's uploaded documents.

The NinerScholars Portal gives students direct access to apply to more than 2,000 scholarship opportunities with one application, through one online system. To access the NinerScholars Portal, learn more about specific scholarship opportunities, or take advantage of additional scholarship resources, visit the University Scholarship Office website at scholarships.charlotte.edu.

Graduate School Donor Fellowships and Scholarships

The Graduate School manages several annual fellowships awarded to new and continuing graduate students. Most awards are made in late March. These include:

- Dr. Craig R. Brown Graduate Fellowship (Master's or Doctoral)
- DRReaM Graduate Fellowship (Master's or Doctoral)
- Faye Jacques Memorial Graduate Fellowship (Master's or Doctoral)
- Herschel and Cornelia Everett First-Year Graduate Fellowship (Master's and Doctoral)
- Joanna R. Baker Memorial Graduate Fellowship (Master's or Doctoral)
- John Paul Lucas, Jr. Scholarship for Educational Leadership (Master's)
- Lucille and Edward C. Giles Dissertation-Year Graduate Fellowship (Doctoral)
- Thomas L. Reynolds Graduate Student Research Award (Master's or Doctoral)
- Wayland H. Cato Jr. First-Year Doctoral Fellowship (Doctoral)
- William F. Kennedy Scholarship (Doctoral)
- Zonta Club Scholarship (Master's or Doctoral)

Most of these awards are offered through the University NinerScholars Portal. Details such as criteria, award amount, and how to apply are available through the University Scholarship Office. Visit scholarships.charlotte.edu for more information.

External Funding

Many organizations outside of the Graduate School and the University offer fellowships and other funding opportunities to students at all levels of graduate education as part of local, national, and international competitions. UNC Charlotte provides students with access to PIVOT, a comprehensive database of funding opportunities. For more information, visit graduateschool.charlotte.edu/funding/funding-graduate-education.

PAYMENT

The Office of the Bursar bills students for tuition, room and board, and various other University charges. Students with a balance receive an email to their UNC Charlotte email address informing them that their bill is available online at my.charlotte.edu. It is the student's responsibility to regularly check their UNC Charlotte email account regularly. Failure to receive a billing statement or view their account online will not exempt students from having their registration canceled for non-payment.

Payment can be made by cash, check, online from a checking or savings account (eCheck), or by credit card (Visa, MasterCard, American Express, or Discover). All

payments must be in U.S. currency. Remittance should be made payable to "UNC Charlotte" and identified with the student name and ID number.

UNC Charlotte offers a payment plan which allows students to spread out their tuition and fees, on-campus housing and dining, and other charges billed to the student's account into multiple installment payments.

Returned Check Policy

If a check is returned by the bank, students are notified via their UNC Charlotte email account, indicating that a penalty of \$35 has been assessed to their student account. A hold is placed on the student's record until the returned check is covered and the penalty is paid.

A student who pays a previous balance with a check in order to have a registration hold flag lifted will have their registration canceled if the check is returned by the bank for any reason.

Parent Information/Authorized Payers

Authorized Payers are family and friends that have been given the ability to access the Student Account information ONLY. In compliance with the Family Educational Rights and Privacy Act of 1974 (FERPA), student financial records may not be shared with a third party without the student's written consent. Adding an authorized payer is the student's written consent that an individual may view their account information and make payments on their behalf. Please note that authorized payers DO NOT have access to a student's stored payment methods, academic records, or other personal information.

Students can add Authorized Payers by logging in to mycharlotte.edu and then clicking the "View or Add Authorized Payer" button located in the My Student Account block.

Authorized Payers will receive an email informing them that they have been granted access to the student's account information. The email notification will include access information that will be used when accessing the information from the Payment/Billing Suite at https://ecom.uncc.edu/C21561_tsa/web/login.jsp.

REFUNDS

Fall and Spring Semesters

Students who officially withdraw (drop all courses) from the University during the Fall or Spring semester will receive a refund as follows:

TUITION AND FEES REFUNDS

Period of Withdrawal	Percent of Tuition and Fees Refunded
Before last day to Add/Drop course(s) with no grade	100%
Period 1*	90%
Period 2*	50%
Period 3*	25%
Period 4*	0%

**Generally, each period is two weeks in length; however, for specific dates of each period, please visit the Refunds Schedule on the Niner Central website at ninercentral.charlotte.edu/billing-payments-refunds/refunds-reductions-hours/refunds-withdrawal*

Summer Terms

Students who officially withdraw (drop all courses) from the University during a Summer term will receive a refund as follows:

TUITION AND FEES REFUNDS

Period of Withdrawal (Summer Terms)	Percent of Tuition and Fees Refunded
Period 1*	100%
Period 2	0%

**Generally, the first period is very short due to the condensed Summer terms; however, for specific dates of each period, please visit the Refunds Schedule on the Niner Central website at ninercentral.charlotte.edu/billing-payments-refunds/refunds-reductions-hours/refunds-withdrawal*

Exceptions

Charges are refundable by administrative action on a prorated basis for the unexpired portion of the term for the following reasons: death of the student, withdrawal for adequate medical reason as certified by the University's Student Health Center or family doctor, death in the immediate family that necessitates student withdrawal, and dismissal or suspension from school. Immediate family is defined as wife, husband, parent, child, brother, sister, grandparent, and grandchildren, and includes step-, half- and in-law relationships. Appropriate documentation must be submitted to the Dean of Students.

Appeal Procedure for Refunds

Students are provided an opportunity to appeal charges associated with tuition, fees, housing, and dining. The student will have the burden of proving a case for appeal by a preponderance of evidence. Appeals will not be considered that arise from a student's error on registration

or situations resulting from a deliberate decision or series of decisions by the student, such as a failure to be aware of deadlines and/or due dates. Full reductions or refunds are typically not granted for students who attend any portion of a semester. Appeals must be substantiated with supporting documentation or verification of extenuating circumstances that warrant basis for the appeal. Extenuating circumstances may include personal or family emergencies as a result of the illness or death of a family member, medical and/or mental health reasons, orders requiring military service, or errors committed by the University. At both levels of appeal, review and consideration for a decision will be based upon the information provided in the appeal as well as the supporting documentation accompanying the appeal.

Appeals submitted without supporting documentation will not be processed for review and consideration until supporting documentation is provided. Students must submit a first level appeal within one calendar year from the date the fee was initially charged to the student. The second level of appeal must be submitted within ten (10) business days of the delivery of the first appeal decision. See thd.charlotte.edu for more details.



The College of Arts + Architecture consists of one school and four departments (the School of Architecture and the Departments of Art and Art History, Dance, Music, and Theatre), which share basic educational values and academic aspirations. At the graduate level, the College offers master's programs in architecture and urban design, a graduate certificate in music, and a North Carolina K-12 teacher licensure graduate certificate program in Art Education (*see the College of Education section in this Catalog for details*).

The primary mission of the College is to provide programs that prepare graduates for careers as architects, urban designers, artists, musicians, leaders, cultural administrators, and innovators in our emerging creative economy. The College draws together in a single academic unit disciplines with common histories, methods of inquiry, and potential for contributions to the community. It serves to enhance creative, professional, and cultural production within UNC Charlotte and to help lead the creative economy in the region and state. The College is responsive to both cross-cultural exchange and interdisciplinary research and programming and seeks to provide new connections to the public realm and new opportunities for community leadership.

College of Arts + Architecture

coaa.charlotte.edu

ARCHITECTURE

- Master of Architecture
- Master of Science in Architecture
 - Design Computation
 - Design Science and Building Systems
- Master of Urban Design
- Master of Architecture and Master of Science in Architecture Dual Degree
- Master of Architecture and History Dual Degree
- Master of Architecture and Urban Design Dual Degree
- Master of Architecture and Master of Science in Information Technology Dual Degree
- Master of Science in Architecture and Master of Arts in Anthropology
- Master of Science in Architecture and Master of Science in Information Technology Dual Degree

School of Architecture

architecture.charlotte.edu

The David R. Ravin School of Architecture at UNC Charlotte offers a fully accredited program recognized for the outstanding quality of its faculty and students, its commitment to outreach and community involvement, and the quality and extent of resources offered through its labs, classrooms, and studios. Students organize their study around concentrations in Urbanism, Technology, or Design, Theory & Practice. Each area of study is well supported not only by coursework but also by travel and research opportunities. The College participates in several international exchange programs and offers summer travel and study programs in Spain, Italy, Canada, Australia, Great Britain, and China to broaden students' global understanding and further inform their work. The specialized study of urban design is also focused under the auspices of either a separate but interrelated graduate program in that discipline or a dual degree program that combines the two-year Master of Architecture program with graduate study in Urban Design. The Urban Design Program is based in UNC Charlotte's Center City Building in the heart of Uptown Charlotte.

Each curricular program offers each student significant individual time and attention, an engaged and accessible faculty, and a wealth of diversity through both the interests of the faculty and the varied background of the graduate students themselves. Because the School stresses the importance of 'making' in addition to thinking, the wood, metal, computer, and digital fabrication workshops are all equipped with the latest high performance equipment to enable students to both explore and embody their design ideas. Contact with the profession is also emphasized and the School is frequently enriched by the expertise of local practitioners. An extensive lecture series involving nationally and internationally recognized designers and theorists further enhances the educational environment and exposure to contemporary schools of thought.

Program Accreditation

The School of Architecture maintains accredited status through the National Architectural Accrediting Board, which reviews the curriculum, facility, faculty, and program resources annually. In addition, the NAAB conducts an intensive site visit every six years. The School has maintained full accreditation standards as prescribed by this board and includes the following required statement:

"In the United States, most registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit professional degree programs in architecture

offered by institutions with U.S. regional accreditation, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted an eight-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards.

Doctor of Architecture and Master of Architecture degree programs may require a preprofessional undergraduate degree in architecture for admission. However, the preprofessional degree is not, by itself, recognized as an accredited degree."

University of North Carolina at Charlotte, School of Architecture, offers the following NAAB-accredited degree programs:

- B.Arch. (158 undergraduate credit hours)
- M.Arch. (preprofessional degree + 60 graduate credit hours)
- M.Arch. (non-preprofessional degree + 96 credit hours)

Master of Architecture

The professional Master of Architecture degree (M.Arch.) is comprised of three curricular tracks: the M.Arch. I (96 credit hours / 3 years, including one summer), M.Arch. II (60 credit hours / 2 years), and M.Arch. A.S. (Advanced Standing) (40 credit hours / 12 months). Full-time academic status in the School of Architecture (SoA) is expected in all programs.

Each curriculum offers full use of the SoA's facilities and labs, a close working relationship with faculty and staff, and a wealth of knowledge and backgrounds given the diverse interests of the graduate student population. The SoA stresses the importance of making in addition to theoretical discourse; hence students have full use of wood, metal, computer, and digifab workshops; equipped with the latest equipment to allow research, exploration, and innovation.

Contact with the profession is also emphasized, and the SoA maintains various programs and visits from local and national practitioners. An extensive lecture series involving recognized designers and thinkers further enhances the educational environment as well as provides exposure to contemporary issues. The School is one of the first NAAB and NCARB approved programs to offer the Integrated Path to Architectural Licensure (iPAL) pathway to its graduate students.

Graduate study in the SoA includes not only on-campus coursework, but also travel and research opportunities. Many studios take field trips during the semester to learn from regional and national cities, such as

New York, Chicago, Seattle, Dallas, and Los Angeles. The School of Architecture also participates in several international exchange programs and has offered summer travel and study programs in Italy, Central Europe, Japan, China, and elsewhere to broaden students' global understanding to further inform their academic experience.

M.Arch Options

The M.Arch. is a NAAB-accredited program that prepares students for professional practice and other career paths in architecture. There are three points of entry to the M.Arch. program based on a student's previous degree, including the M.Arch. I, M.Arch. II, and M.Arch. A.S. (Advanced Standing). Prospective students should indicate to which track they are applying in their application.

M.Arch. I

The three and a half year M.Arch. I curriculum is open to students whose previous degree is outside the field of architecture. The M.Arch. I curriculum involves three primary components: 1) the first year (including a summer session that follows the first year) focuses on establishing a strong foundation in fundamental design skills, architectural history and theory, building-to-site relationships, and introductory building and computational technologies; 2) the second year focuses on advanced and topical design issues and their relationship to building systems as well as advanced studies in history, theory, and building technology; and 3) the third year emphasizes integrated design, professional practice, and electives. The concluding experience incorporates a design research diploma project.

M.Arch. II

The two-year M.Arch. II curriculum serves students who have already completed a four-year degree program in architecture at a National Architectural Accrediting Board (NAAB) accredited institution. The courses and options within M.Arch. I and M.Arch. II are similar, but the prior education in an NAAB program for M.Arch. II students allows the completion of the degree in two years.

The M.Arch. II curriculum is tailored through the advising process to the previous educational background of the students and to their individual professional and research goals. The program involves two primary components: 1) the first year focuses on advanced building design and topical design studios, as well as advanced studies in history, theory, computation, and building technologies; and 2) the second year focuses on building design integration, specialization through electives, and a final design research diploma project.

M.Arch. A.S.

The M.Arch. A.S. (Advanced Standing) curriculum at UNC Charlotte is designed for School of Architecture

undergraduate degree holders who have established a strong record of academic achievement in their four years of study. The track is earned in three semesters (40 credit hours) and, paired with the UNC Charlotte B.A. in Architecture degree, designed to meet National Architectural Accrediting Board (NAAB) accredited standards.

The program involves two primary components: 1) an intensive first semester summer program that acts as a threshold to graduate level inquiry, and 2) a final year that focuses on building design integration, specialization through electives, and a final design research diploma project.

Dual Degree Options

Students in the M.Arch. II or A.S. tracks, and occasionally in the M.Arch. I track, may wish to combine their professional architecture studies with graduate work in other programs. These dual degrees typically add a calendar year to student's course of study.

Options include the M.Arch./MSIT Dual Degree, with a research-based specialization in computational design, and the M.Arch./M.U.D Dual Degree, for a specialization in urban design. The M.U.D program includes one summer with a required study abroad experience and is housed off the main campus in the Dubois Center at UNC Charlotte Center City.

Admission Requirements

The following requirements are expected of applicants to the M.Arch. program:

- A minimum undergraduate GPA of 3.0.
- All UNC Charlotte Graduate School application requirements, including a statement of purpose of objectives relative to graduate study in architecture, a current curriculum vitae (CV), transcripts from all other colleges and universities attended, and three letters of recommendation.
- School of Architecture application requirements, including a digital portfolio of creative work. Applicants to the M.Arch. I curriculum should submit examples of work that offer evidence of creativity, self-motivation, analysis, and critical thinking. Such examples are not expected to be architectural in nature. Visual work such as painting, sculpture, furniture making, photography, etc., are acceptable, as are fiction writing, poetry, and any other reasonable evidence of sustained creative endeavor. Applicants to the M.Arch. II curriculum should offer significant evidence of a mastery of architectural skill and knowledge as well as other creative work.
- Applicants to the M.Arch. I curriculum are expected to have completed introductory, college-level physics and pre-calculus courses.

- Applicants to the M.Arch. II curriculum are expected to have a minimum of six semesters of architectural design studios, two semesters of architectural history/theory, and four semesters of architectural technology equivalent to the following UNC Charlotte's School of Architecture courses:

ARCH 5301 - Materials and Assembly Principles (3)
 ARCH 5302 - Environmental Systems Principles (3)
 ARCH 5303 - Structural Principles (3)
 ARCH 5304 - Structural Systems (3)

Automatic Recommendation for Admissions into M.Arch Program

The School of Architecture Graduate Admissions Committee will automatically endorse applications from students earning a Bachelor of Arts in Architecture from UNC Charlotte with a final GPA of 3.5 (both overall and in the major). UNC Charlotte B.A. in Architecture students who meet this criteria at the conclusion of their undergraduate studies do not need to submit the secondary materials required by the School of Architecture application; however, they should do so if they wish to be considered for Graduate Assistantships, or if there is a possibility that their GPA will slip below 3.5 before graduation.

Applicants, including those automatically recommended by the School of Architecture, must still apply to and be accepted by the UNC Charlotte Graduate School, and they must submit all of the materials required by the Graduate School listed above.

Master of Architecture I Curriculum

The M.Arch. I curriculum requires a minimum of 96 credit hours to be completed during three academic years and one summer session. The curriculum is offered for those having a undergraduate degree in other disciplines that are outside of architectural design.

Year One

Fall (15 credit hours)

ARCH 5201 - Architectural History I: Prehistory-1750 (3)
 ARCH 5301 - Material and Assembly Principles (3)
 ARCH 6101 - Design Studio: Fundamentals (6)
 ARCH 6602 - Representation I: Fundamentals (3)

Spring (15 credit hours)

ARCH 5202 - Architectural History II: 1750-Present (3)
 ARCH 5302 - Environmental Systems Principles (3)
 ARCH 6102 - Design Studio: Fundamentals (6)
 ARCH 6603 - Representation II: Digital Fundamentals (3)

Summer (6 credit hours)

ARCH 6103 - Design Studio Basics (6)

Year Two

Fall (15 credit hours)

ARCH 5203 - Architectural History III: Survey of Contemporary Theory (1950-Present) (3)
 ARCH 5303 - Structural Principles (3)
 ARCH 5604 - Computational Methods (3)
 ARCH 7101 - Design Studio Topics (6)

Spring (15 credit hours)

ARCH 5060 - History/Theory Topics (3)
 ARCH 5304 - Structural Systems (3)
 ARCH 5605 - Computational Practice (3)
 ARCH 7102 - Design Studio Topics (6)

Year Three

Fall (15 credit hours)

ARCH 5050 - Architecture Topics (1 to 6) (*3 credit hours*)*
 ARCH 5305 - Building Systems Integration (3)
 ARCH 7103 - Design Studio Integrated Project (6)
 ARCH 7201 - Research and Design Methods (3)

Spring (15 credit hours)

ARCH 5050 - Architecture Topics (1 to 6) (*6 credit hours required*)*
 ARCH 5206 - Professional Practice (3)
 ARCH 7104 - Design Studio Diploma Project (6)

* Note: ARCH 5000, ARCH 5060, ARCH 6050, ARCH 6306, ARCH 6400, or ARCH 6890 can be substituted for ARCH 5050.

Degree Total = 96 Credit Hours

Master of Architecture II Curriculum

The M.Arch. II curriculum requires a minimum of 60 credit hours to be completed during two academic years. If applicants accepted to the M.Arch. II curriculum are evaluated and found deficient in entry-level competencies, curriculum substitutions and/or additional courses will be required.

To ensure that incoming students are evaluated appropriately, the School of Architecture may require candidates for the M.Arch. II curriculum to furnish the Architecture Graduate Admissions Committee and Graduate Program Coordinator relevant course descriptions, syllabi, and course materials (where necessary) of all architecture courses passed and completed that may satisfy entry-level competencies.

Year One

Fall (15 credit hours)

ARCH 5203 - Architectural History III: Survey of Contemporary Theory (1950-Present) (3)*
 ARCH 5604 - Computational Methods (3)**

ARCH 6306 - Technology Topic (3)
ARCH 7101 - Design Studio Topics (6)

** UNC Charlotte undergraduates who have previously taken ARCH 4203 should substitute ARCH 5060 - for ARCH 5203.*

*** UNC Charlotte undergraduates who have previously taken ARCH 4604 should substitute architectural electives (ARCH 5050 or ARCH 6306) for ARCH 5604 and/or ARCH 5605.*

Spring (15 credit hours)

ARCH 5060 - History/Theory Topics (3)
ARCH 5605 - Computational Practice (3)
ARCH 6306 - Technology Topic (3)
ARCH 7102 - Design Studio Topics (6)

Year Two

Fall (15 credit hours)

ARCH 5050 - Architecture Topics (1 to 6) (3 credit hours required)***
ARCH 5305 - Building Systems Integration (3)
ARCH 7103 - Design Studio Integrated Project (6)
ARCH 7201 - Research and Design Methods (3)

Spring (15 credit hours)

ARCH 5050 - Architecture Topics (1 to 6) (6 credit hours required)***
ARCH 5206 - Professional Practice (3)
ARCH 7104 - Design Studio Diploma Project (6)

*** Note: ARCH 5000, ARCH 5060, ARCH 6050, ARCH 6306, ARCH 6400, or ARCH 6890 can be substituted for ARCH 5050.

Degree Total = 60 Credit Hours

Master of Architecture - Advanced Standing Curriculum

Highly qualified applicants from UNC Charlotte's Bachelor of Arts in Architecture program may be considered for Advanced Standing in the Master of Architecture program. The M.Arch. A.S. (Advanced Standing) is a 40 credit hour graduate degree path leading to an accredited professional degree in Architecture. The program builds upon a set of intensive summer experiences that bridge the undergraduate and graduate programs at UNC Charlotte.

Summer (10 credit hours)

ARCH 6050 - Architectural Elective (1 to 6) (4 credit hours required)
ARCH 7101 - Design Studio: Topics (6)

Fall (15 credit hours)

ARCH 5050 - Architecture Topics (1 to 6) (3 credit hours

required) *

ARCH 5305 - Building Systems Integration (3)
ARCH 7103 - Design Studio Integrated Project (6)
ARCH 7201 - Research and Design Methods (3)

Spring (15 credit hours)

ARCH 5050 - Architecture Topics (1 to 6) (6 credit hours required) *
ARCH 5206 - Professional Practice (3)
ARCH 7104 - Design Studio Diploma Project (6)

*Note: ARCH 5000, ARCH 5060, ARCH 6050, ARCH 6306, ARCH 6400, or ARCH 6890 can be substituted for ARCH 5050.

Degree Total = 40 Credit Hours

Grade Requirements

The School of Architecture's degree requirements follow those stated in the *Graduate Catalog*. Students must maintain a 3.0 GPA or greater to qualify for degree conferral.

Additionally, the M.Arch. requires that students: 1) may not receive more than one C in a design studio. If more than one C is assigned in required studios, then one studio (as determined by the Associate Director and Graduate Program Director) must be retaken with an earned grade of B or above.

Retaking a course may extend a student's time to degree status. No more than two (2) courses may be retaken in the program.

Integrated Path to Architectural Licensure (iPAL)

In 2015, the School of Architecture at UNC Charlotte was selected by the National Council of Architectural Registration Boards (NCARB) as one of 14 architecture programs in the U.S. to offer an inaugural "Integrated Path to Architectural Licensure" (iPAL) pathway as part of its NAAB-accredited M.Arch. programs. The iPAL curriculum integrates academic coursework, Architectural Experience Program (AXP) internship, and Architecture Registration Exam (ARE) as part of one's professional architectural education.

The core of the program features a structured full-time internship during summer terms, part-time internship during the academic year and a one-year, full-time internship prior to one's final year of study. The iPAL curriculum adds one year of office placement for those pursuing the M.Arch. II and M.Arch. A.S. tracks. Successful participants in the program are eligible for all six sections of the ARE prior to graduation. Candidates must have a record of at least 1250 hours of documented AXP credits prior to starting their M.Arch. curricula. Participants must submit their interests and qualifications via an application process

after admittance to the M.Arch. Contact the Graduate Program Director for additional information about the iPAL pathway.

Architectural Elective Courses

Architectural Elective Courses are available in a wide variety of topical subjects, and are listed under the general course number ARCH 5050 or ARCH 6050, the technology topics number ARCH 6306, or the history/theory topics number ARCH 5060.

These courses complement the core courses and studios and allow students to pursue their specific interests. Architectural History Topics Courses complement the architectural history survey courses (ARCH 5201, ARCH 5202, ARCH 5203), and serve to inform and develop in-depth research, writing, and presentation skills. Entering MArch II students who have previously satisfied ARCH 5203 will be required to take an Architectural History Topic to satisfy their degree requirement.

Current elective offerings can be viewed in Banner Self Service or the School of Architecture website. Recent offerings have included:

History and Theory (ARCH 5060)

- Humanitarian Architecture
- From Auschwitz to Zapruder: Mapping the Mid-Century
- Histories of Latin American Architecture
- Architecture and Production
- Museums and Memorials
- Theories of Architectural Space
- Brave New Worlds
- Critical Heritage Studies

Architectural Technology (ARCH 6306)

- Sustainable Facade Systems
- Sustainability and Climate Responsive Architecture
- Atmospheric Animations
- High Performance, Low Tech
- Build, Test, Iterate, Repeat

Computation (ARCH 5050/ARCH 6050)

- History of Computational Design
- Computational Theory
- Computational Research Methods

Urbanism (ARCH 5050/ARCH 6050)

- Engaging Urban Futures
- Community Planning Workshop
- Dilemmas of Modern City Planning
- Modern City: Theories and Forms
- Urban Form: Race and Place
- Hip Hop Urbanism

General Architecture Electives (ARCH 5050/ARCH 6050)

- Mark
- Structure of the Everyday
- Humanitarian Design
- Equity and Social Justice in Architecture
- Japanese Conceptions of Space
- Good Fast Cheap
- Public Transportation
- Airport Terminal Design
- The Material Landscape
- Detailing

Requisite and Capstone Experiences

Integrated Project Design

The Design Studio: Integrated Project Design (ARCH 7102) serves as the requisite studio experience that advances foundational studios and topical studios for all M.Arch. students. Taken in the sixth semester of enrollment for M.Arch. I students and in the third semester of enrollment for M.Arch. II students, the Design Studio: Integrated Project Design is defined as an architectural building design project that comprehensively demonstrates the student's ability to conceptualize, prepare, organize, and design a building having a specific programmatic type. All students must demonstrate competency before they engage in the final semester of study.

Diploma

The capstone for M.Arch. I, M.Arch. II, and M.Arch. AS students occurs in their final semester in ARCH 7104. This is defined as an architectural design diploma project that demonstrates the students' ability to apply research to identify and engage a specific set of issues, a building design construct, and a site or contextual condition.

Diploma project students, in conjunction with their studio professors, will identify the issue(s) to be engaged and the research and/or design methods through which this engagement will take place. Design research is defined as an architectural project that engages and explicates primary source material leading to project work possessing an original argument. This diploma project includes design-related materials as part of the final submission. Materials from data and information gathered from original texts and documents, data resulting from experiments, demographic data, interviews, etc. are the means to base and launch the design activities of the diploma project.

For students in the M.Arch./M.U.D. dual degree program, the diploma project may have a focus on the integration of architectural and urban design issues.

Graduate Advising

A critical component of any successful graduate program

is academic advising and guidance during the course of a student's program of study. The primary advisor for all graduate students in the School of Architecture is the Associate Director, in consultation with the appropriate Graduate Program Director.

Transfer Credit

Transfer credit may be possible up to a maximum of 20% of the overall course credit hours required for the Master of Architecture I and Master of Architecture II degree programs. Transfer credit is not accepted into the Master of Architecture II Advanced Standing (UNC Charlotte School of Architecture B.A. graduates only). The Associate Director and Graduate Program Director oversee all requests for such transfer credit.

Waiver Credit

Waiver credit may be allowed if a student can demonstrate that a course (or courses) taken at the post-undergraduate level equals or exceeds in both content and rigor of a course or courses required in the graduate curriculum. Grades received for such courses must be B or above. In such cases, credit is permitted by examination. If a required course in the curriculum is waived, the student is allowed to fill those credit hours with another course as advised by the Associate Director, in consultation with the Graduate Program Director.

Application for Degree

In order to meet UNC Charlotte's Graduate School requirements for degree candidacy, all graduate students must receive a written certification from their department confirming successful coursework completion. This report requires approvals from the Graduate Program Director as well as Graduate School administrators. The completion of this report results in the granting of the degree. In addition, each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Assistantships, Tuition Differentials, and Scholarships

A number of teaching and research assistantships, scholarships, tuition awards, and graduate tuition assistantship program support (GASP), are available to both high performing M.Arch. I, M.Arch. II, and M.Arch. A.S. candidates. No separate assistantship application is required; awards are based on application materials to the program, and award decisions are made based on the applicant's academic merit or promise of academic merit, and/or on demonstration of need. Portfolio and the merits of prior design work are extremely important in such award determinations. Tuition awards are typically paired with teaching and/or research assistantship stipends. School of Architecture scholarships supported through private endowments are available to students enrolled in the program pending an application. In addition, other awards are available under independent faculty or research center grants.

Master of Science in Architecture

The Master of Science (M.S.) in Architecture is a non-professional 30 credit hour degree focusing on emerging research critical to the architectural profession, which requires expertise that exceeds or complements current criteria for accredited professional degrees.

Concentrations include:

- **Design Computation:** Design has become increasingly important to computer scientists and at the same time computation has become important to designers. This program combines the strength and insights of each discipline to collaborate on tasks that challenge both fields. As firms rely more and more on computation, those who know how to think, program and script will be able to change the way architects design and practice. This concentration culminates in a directed independent thesis.
- **Sustainable Building Technology:** This concentration focuses on sustainable materials, processes, and practices in the built environment. Students and faculty explore structural principles, statics and strength of materials, structural systems, building technology, intelligent structures, innovative structural assemblies, and integrated design. This concentration culminates in a directed independent thesis.
- **Critical Heritage Studies:** The preservation and interpretation of the built environment is interconnected with both social and

environmental sustainability and integrated within discourses and practices surrounding other tangible and intangible heritages happening in museums, archeological sites, and elsewhere. This concentration seeks local solutions while engaging in global conversations; emphasizes hands-on engagement with communities and organizations; challenges authorized heritage discourses; diversifies approaches and practices of engaging with the past; and promotes the stories and sites that foreground the heritage of underrepresented communities. This concentration culminates with an internship and a practice focused colloquium.

Admission Requirements

Application to the M.S. in Architecture follows existing Graduate School and School of Architecture admissions processes. The UNC Charlotte application process is completely online.

The minimum admission requirements for the M.S. in Architecture at UNC Charlotte are:

- An earned bachelor's degree from a college or university accredited by an accepted accrediting body
- An overall undergraduate GPA of at least a 3.0 (based on a 4.0 scale)
- A minimum TOEFL score of 220 (computer-based), 557 (paper-based), or 83 (Internet-based) or a minimum IELTS band score of 6.5 required from any applicant whose native language is not English

Documents Required For Admission

To apply for graduate studies in the School of Architecture, all applicants must submit the following application materials to the UNC Charlotte Office of Graduate Admissions:

- Graduate School Application for Admission (online)
- Application Fee (payable online)
- Unofficial transcripts from all previous college-level institution(s) attended (submitted online)
- Official TOEFL scores
- Three recommendations (submitted online by recommenders)
- A resume (submitted online)
- A statement of purpose indicating research interest and potential faculty advisor (submitted online)
- Digital Portfolio illustrative of research interests (20-page PDF document that may include samples of writing, research, reports, and/or design-based projects) or in the case of the Critical Heritage concentration, students may submit an academic writing sample (20-page minimum PDF)

Automatic Recommendation for Admissions into M.S. Program

The School of Architecture Graduate Admissions Committee will automatically endorse applications from students earning a Bachelor of Arts in Architecture from UNC Charlotte with a final GPA of 3.5 (both overall and in the major). UNC Charlotte B.A. in Architecture students who meet this criteria at the conclusion of their undergraduate studies do not need to submit the secondary materials required by the School of Architecture application; however, they should do so if they wish to be considered for Graduate Assistantships, or if there is a possibility that their GPA will slip below 3.5 before graduation.

Applicants, including those automatically recommended by the School of Architecture, must still apply to and be accepted by the UNC Charlotte Graduate School, and they must submit all of the materials required by the Graduate School listed above.

Degree Requirements – Design Computation Concentration

The curriculum for students in the Design Computation concentration consists of the following components:

- one course focused on their area - computational research methods
- a general Responsible Conduct of Research course
- a project-based research lab
- a series of elective courses of their choice
- a thesis prep course
- a capstone thesis

Core Courses (12 credit hours)

ARCH 5611 - Computational Research Methods (3)
 ARCH 7211 - Research Lab (4 to 6) * (4 credits)
 ARCH 7800 - Thesis Prep (3)
 GRAD 6302 - Responsible Conduct of Research (2)

Elective Courses (12 credit hours)

As directed by their Program Director and based on course availability, students in the Design Computation concentration should take a total of 12 credit hours of electives from the list below.

ARCH 5050 - Architecture Topics (1 to 6)
 ARCH 6050 - Architecture Topics (1 to 6)
 ARCH 5607 - Digital Fabrication (3)
 ARCH 6306 - Technology Topic (3)
 ARCH 6890 - Directed Independent Study (1 to 6)
 DSBA 5122 - Visual Analytics and Storytelling (3)
 DSBA 6156 - Applied Machine Learning (3)
 DSBA 6160 - Database Systems for Data Scientists (3)
 DSBA 6162 - Knowledge Discovery in Databases (3)
 DSBA 6165 - Artificial Intelligence and Deep Learning (3)

Capstone (6 credit hours)

ARCH 7900 - Thesis

Degree Requirements – Sustainable Building Technology Concentration

The curriculum for students in the Sustainable Building Technology concentration consists of the following components:

- one course focused on their area - an architectural elective on sustainability
- a general Responsible Conduct of Research course
- a project-based research lab
- a series of elective courses of their choice
- a thesis prep course
- a capstone thesis

Core Courses (12 credit hours)ARCH 5050 - Architecture Topics (1 to 6) **(3 hours as directed)*ARCH 7211 - Research Lab (4 to 6) *(4 credits)*

ARCH 7800 - Thesis Prep (3)

GRAD 6302 - Responsible Conduct of Research (2)

Elective Courses (12 credit hours)

As directed by their Program Director based on course availability, students in the Sustainable Building Technology concentration should take a total of 12 credits of architectural elective courses. These 12 credits can be any combination of ARCH 5050, ARCH 6050, ARCH 6306, and ARCH 6890 courses.

ARCH 5050 - Architecture Topics (1 to 6)

ARCH 6050 - Architecture Topics (1 to 6)

ARCH 6306 - Technology Topic (3)

ARCH 6890 - Directed Independent Study (1 to 6)

Capstone (6 credit hours)

ARCH 7900 - Thesis

Degree Requirements – Critical Heritage Studies Concentration

The curriculum for students in the Critical Heritage Studies concentration consists of the following curricular components:

- two courses focused on their area - critical approaches to heritage and historic preservation
- a project-based research lab
- a series of elective courses of their choice from a range of related disciplines
- a minimum 3-credit internship
- a capstone colloquium

Core Courses (13 credit hours)

ARCH 5600 - Critical Approaches to Heritage (3)

ARCH 6400 - Architecture Internship (1 to 6) *(minimum 3 credit hours)*ARCH 7211 - Research Lab (4 to 6) *(4 credit hours)*

HIST 6320 - Historic Preservation (3)

Elective Courses (15 credit hours)

As directed by their Program Director and based on course availability, students should take a total of 15 credit hours of electives from the list below.

ANTH 5122 - Ethnographic Methods (3)

ANTH 6050 - Advanced Topics in Archaeology (3)

ARCH 5060 - History/Theory Topics (3)

HIST 6300 - Topics in Public History (3)

Capstone (2 credit hours)

ARCH 6600 - Heritage Colloquium

Degree Total = 30 Credit Hours

Master of Urban Design

The Master of Urban Design (M.U.D) program prepares students and professionals to engage complex issues faced by towns and cities across America. The program uses the fast-changing Charlotte metropolitan region as its laboratory to provide students with relevant design skills to influence urban life under the pressures of globalization, environmental change, and cultural diversification. To emphasize this global perspective, part of the final Summer semester is based outside the U.S., framing Charlotte's design problems within a global context.

The first semester in the Fall focuses on the fundamental skills and techniques of urban design. The second semester in the Spring foregrounds issues of integrated networks, systems, and datascares that affect urban life. The third semester during the Summer examines advanced topics through complex urban design problems in locations outside the U.S. Each semester also includes seminar courses, some of which comprise individual elective choices from a menu of topics in urban design and urban history and theory.

The Master of Urban Design (M.U.D) degree serves two groups of students: (1) Students with an architecture or landscape architecture undergraduate or graduate degree (including a B.Arch. five-year degree) and (2) those holding a B.A. or B.S. undergraduate degree or a master's degree from disciplines other than architecture or landscape architecture. For those students with an architectural or landscape undergraduate or graduate qualifications, the courses within the program can be completed in one

calendar year/three consecutive semesters of full-time enrollment from late August one year to early August the following year (Fall-Spring-Summer).

For students with undergraduate or graduate degrees in planning or other non-design disciplines, the program begins with an intensive second Summer semester experience in the July preceding enrollment in the Fall semester. Students with an interior design background will be evaluated on an individual basis regarding enrollment in this preparatory class.

The Master of Urban Design (M.U.D) degree can be taken as a stand-alone qualification, or may be combined with a Master of Architecture for a dual M.Arch./M.U.D degree. Opportunities also exist for students to craft individually approved curricula combining the M.U.D degree with the M.A. in Geography (Community Planning concentration) or with the Master of Science in Real Estate (M.S.R.E.). These dual degrees typically add two or more calendar years to a student's course of study.

Admission Requirements

Online applications must be made to the UNC Charlotte Graduate School. The following requirements are expected of applicants to the M.U.D. program:

- A minimum undergraduate GPA of 3.0
- UNC Charlotte Graduate School application requirements, including a statement of purpose describing objectives relative to graduate study in urban design, a current curriculum vitae (CV), transcripts from all other colleges and universities attended, GRE scores (where applicable), and three letters of recommendation
- School of Architecture application requirements, including a portfolio of creative work. Applicants should submit examples of work that offer evidence of creativity, self-motivation and critical appraisal. Such examples do not have to be solely urban design-related, but may also include visual work such as painting, sculpture, furniture making, photography, writing, and other reasonable evidence of their creative abilities. However, the portfolio must include some clear visual and/or written evidence of an interest in urban settings and conditions.

Automatic Recommendation for Admission

The School of Architecture Graduate Admissions Committee will automatically endorse applications from students earning a Bachelor of Arts in Architecture from UNC Charlotte with a final GPA of 3.5 (both overall and in the major). UNC Charlotte B.A. in Architecture students who meet this criteria at the conclusion of their undergraduate studies do not need to submit the secondary materials required by the School of Architecture application; however, they should do so if

they wish to be considered for Graduate Assistantships, or if there is a possibility that their GPA will slip below 3.5 before graduation.

Applicants, including those automatically recommended by the School of Architecture, must still apply to and be accepted by the UNC Charlotte Graduate School, and they must submit all of the materials required by the Graduate School listed above.

Dual Degree Admission

Students wishing to pursue a dual degree in a related field such as Architecture, Geography, or Real Estate should submit separate applications to those second degree programs, including the M.Arch., M.A. in Geography, or M.S.R.E. Applicants should be sure to meet all submission requirements of each program and are encouraged to reach out to the Graduate Program Directors of the second degree programs in which they are interested.

Degree Requirements

The M.U.D. program requires a minimum of 36 hours to be completed (39 hours for non-design based applicants). There are two study options: (1) a full-time program that can be completed in three consecutive semesters (Fall-Spring-Summer), or (2) a part-time option for working professionals that may be completed generally within two years. However, part-time students should note that the foreign-based Summer studio has to be taken as a full-time commitment.

Students enrolled in the dual degree M.Arch. II/M.U.D. program complete their extended program in three calendar years of full-time study, including the Summer semester spent abroad in either China, Europe, or South America, according to program rotation. The dual degree option is only available to full-time students.

A) Full-Time M.U.D. Option

Year One

Second Summer Session (3 credit hours)

MUDD 5101 - Design Basics (3) *(For non-design based applicants only. May be waived if determined in the admissions process.)*

Fall (12 credit hours)

MUDD 6101 - Urban Design Studio I (6)
MUDD 6205 - Modern City: Theories and Forms (3)
MUDD 6606 - GIS and Urban Mapping (3)

Spring (12 credit hours)

MUDD 5601 - Community Planning Workshop (3)
MUDD 6050 - Urban Design Elective (3)
MUDD 6102 - Urban Design Studio II (6)

Foreign-Based First Summer Session (6 credit hours)

MUDD 7120 - Graduate Summer International Study (3 to 6)

Charlotte-Based Second Summer Session (6 credit hours)

MUDD 7102 - Urban Design Studio III (3 or 6)

B) Part-Time M.U.D. Option**Year One****Summer (3 credit hours)**

MUDD 5101 - Design Basics (3) *(For non-design based applicants only. - May be waived if determined in the admissions process.)*

Fall (6 credit hours)

MUDD 6205 - Modern City: Theories and Forms (3)

MUDD 6606 - GIS and Urban Mapping (3)

Spring (6 credit hours)

MUDD 5601 - Community Planning Workshop (3)

MUDD 6050 - Urban Design Elective (3)

Year Two**Fall (6 credit hours)**

MUDD 6101 - Urban Design Studio I (6)

Spring (6 credit hours)

MUDD 6102 - Urban Design Studio II (6)

Foreign-Based First Summer Session (6 credit hours)

MUDD 7120 - Graduate Summer International Study (3 to 6)

Charlotte-Based Second Summer Session (6 credit hours)

MUDD 7102 - Urban Design Studio III (3 or 6)

Urban Design Elective Courses

Urban Design Elective Courses are available in a wide variety of topical subjects, and are listed under the general course number MUDD 6050. These courses complement the core courses and studios and allow students to pursue their specific interests. These may be repeated for credit with change of topic. Topics include: Computation, Theory, Representation, Making, Urbanism, and Technology. Current elective offerings can be viewed in the Schedule of Classes or the School of Architecture website.

Degree Total = 36-39 Credit Hours

Master of Architecture and Master of Science in Architecture Dual Degree

The Master of Architecture (MArch) / Master of Science (MS) in Architecture enables students to pursue a specialized, research-based degree in architecture (the MS) concurrently with their general, professional degree in architecture (the MArch, which leads to architectural licensure).

The following nine combinations are possible:

- MArch I + MS in Architecture - Critical Heritage Studies concentration
- MArch I + MS in Architecture - Design Computation concentration
- MArch I + MS in Architecture - Sustainable Building Technology concentration
- MArch II + MS in Architecture - Critical Heritage Studies concentration
- MArch II + MS in Architecture - Design Computation concentration
- MArch II + MS in Architecture - Sustainable Building Technology concentration
- MArch Advanced Standing + MS in Architecture - Critical Heritage Studies concentration
- MArch Advanced Standing + MS in Architecture - Design Computation concentration
- MArch Advanced Standing + MS in Architecture - Sustainable Building Technology concentration

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of their third semester (including Summer). For each program, students must indicate the concentration for which they are eligible and interested as part of the application process. No admission requirements established by the Graduate School or by either individual program may be waived. See Architecture, M.Arch. and Architecture, M.S. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements for the M.Arch. and M.S. Arch. in their specific concentrations, with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses sections below for permissible course sharing.

Students enrolled in the Dual Degree M.S. Arch. / M.Arch. program are required to complete the capstones for each program, including the M.Arch Diploma project (ARCH 7104) and the M.S.Arch capstone (ARCH 6600 Colloquium

for Critical Heritage Studies concentration and ARCH 7900 Thesis for Design Computation and Sustainable Building Technology).

Upon successful completion of all requirements, students receive both the Master of Architecture degree and the M.S. in Information Technology degree.

Shared Courses

M.Arch. I / M.S. Arch – Critical Heritage Studies

Architecture, M.S. (Critical Heritage Studies Concentration)

The Architecture, M.S. - Critical Heritage Studies concentration allows 9 credits to be shared from the Master of Architecture I program as follows:

Degree Requirement(s)	ARC 1 Course(s) Allowed	Credits
Concentration Elective	ARCH 7104 Design Studio Diploma Project	6
Concentration Elective	ARCH 7201 Research and Design Methods	3

Architecture, M.Arch. (ARC1 Concentration)

The Master of Architecture I program concentration allows 15 credits to be shared from the Architecture, M.S. - Critical Heritage concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	HIST 6320 Historic Preservation	3
	ARCH 6400 Architecture Internship	3
ARCH 5060 Architectural History / Theory Topics	ARCH 5600 Critical Approaches to Heritage	3
ARCH 6103 Design Studio: Basics	ARCH 7211 Research Lab	4
	ARCH 6600 Heritage Colloquium	2

Dual Degree Total = 102 Credit Hours

Shared Courses

M.Arch. II / M.S. Arch – Critical Heritage Studies

Architecture, M.S. (Critical Heritage Studies Concentration)

The Architecture, M.S. - Critical Heritage Studies concentration allows 9 credits to be shared from the Master of Architecture II program as follows:

Degree Requirement(s)	ARC 1 Course(s) Allowed	Credits
Concentration Elective	ARCH 7104 Design Studio Diploma Project	6
Concentration Elective	ARCH 7201 Research and Design Methods	3

Architecture, M.Arch. (ARC2 Concentration)

The Master of Architecture II program concentration allows 15 credits to be shared from the Architecture, M.S.

– Critical Heritage concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	HIST 6320 Historic Preservation	3
	ARCH 6400 Architecture Internship	3
ARCH 5060 Architectural History / Theory Topics	ARCH 5600 Critical Approaches to Heritage	3
ARCH 6103 Design Studio: Basics	ARCH 7211 Research Lab	4
	ARCH 6600 Heritage Colloquium	2

Dual Degree Total = 66 Credit Hours

Shared Courses

M.Arch. Advanced Standing / M.S. Arch – Critical Heritage Studies

Architecture, M.S. (Critical Heritage Studies Concentration)

The Architecture, M.S. - Critical Heritage Studies concentration allows 9 credits to be shared from the Master of Architecture AS program as follows:

Degree Requirement(s)	ARC 1 Course(s) Allowed	Credits
Concentration Elective	ARCH 7104 Design Studio Diploma Project	6
Concentration Elective	ARCH 7201 Research and Design Methods	3

Architecture, M.Arch. (ARC AS Concentration)

The Master of Architecture AS program concentration allows 9 credits to be shared from the Architecture, M.S. - Critical Heritage concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	HIST 6320 Historic Preservation	3
	ARCH 6400 Architecture Internship	3
ARCH 5060 Architectural History / Theory Topics	ARCH 5600 Critical Approaches to Heritage	3

Dual Degree Total = 52 Credit Hours

Shared Courses

M.Arch. I / M.S. Arch – Design Computation

Architecture, M.S. (Design Computation Concentration)

The Architecture, M.S. program - Design Computation concentration allows 9 credits to be shared from the

Master of Architecture I program as follows:

Degree Requirement(s)	ARC 1 Course(s) Allowed	Credits
Concentration Elective	ARCH 7104 Design Studio Diploma Project	6
Concentration Elective	ARCH 7201 Research and Design Methods	3

Architecture, M.Arch. (ARC1 Concentration)

The Master of Architecture I program concentration allows 15 allows 15 credits to be shared from the Master of Architecture, M.S. - Design Computation concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7800 Thesis Prep	3
	ARCH 7900 Thesis	6
ARCH 6103 Design Studio: Basics	ARCH 7211 Research Lab	4
	GRAD 6302 Responsible Conduct of Research	2

Dual Degree Total = 102 Credit Hours

Shared Courses

M.Arch. II / M.S. Arch – Design Computation

Architecture, M.S. (Design Computation Concentration)

The Architecture, M.S. program - Design Computation concentration allows 9 credits to be shared from the Master of Architecture II program as follows:

Degree Requirement(s)	ARC 2 Course(s) Allowed	Credits
Concentration Elective	ARCH 7104 Design Studio Diploma Project	6
Concentration Elective	ARCH 7201 Research and Design Methods	3

Architecture, M.Arch. (ARC2 Concentration)

The Master of Architecture II program concentration allows 15 credits to be shared from the Master of Architecture, M.S. - Design Computation concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7800 Thesis Prep	3
	ARCH 7900 Thesis	6
ARCH 7102 Design	ARCH 7211 Research Lab	4

Studio Topics	GRAD 6302 Responsible Conduct of Research	2

Dual Degree Total = 66 Credit Hours

Shared Courses

M.Arch. Advanced Standing / M.S. Arch – Design Computation

Architecture, M.S. (Design Computation Concentration)

The Architecture, M.S. - Design Computation concentration allows 9 credits to be shared from the Master of Architecture AS program as follows:

Degree Requirement(s)	ARC AS Course(s) Allowed	Credits
Concentration Elective	ARCH 7104 Design Studio Diploma Project	6
Concentration Elective	ARCH 7201 Research and Design Methods	3

Architecture, M.Arch. (ARC AS Concentration)

The Master of Architecture AS program concentration allows 9 credits to be shared from the Master of Architecture, M.S. - Design Computation concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7800 Thesis Prep	3
	ARCH 7900 Thesis	6

Dual Degree Total = 52 Credit Hours

Shared Courses

M.Arch. I / M.S. Arch – Sustainable Building Technology

Architecture, M.S. (Sustainable Building Technology Concentration)

The Architecture, M.S. - Sustainable Building Technology concentration allows 9 credits to be shared from the Master of Architecture I program as follows:

Degree Requirement(s)	ARC 1 Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7201 Research and Design Methods	3
ARCH 6050 Architecture Topics	ARCH 7104 Design Studio Diploma Project	6

Architecture, M.Arch. (ARC1 Concentration)

The Master of Architecture I program concentration allows 15 credits to be shared from the Architecture, M.S. – Sustainable Building Technology concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7800 Thesis Prep	3
	ARCH 7900 Thesis	6
ARCH 6103 Design Studio: Basics	ARCH 7211 Research Lab	4
	GRAD 6302 Responsible Conduct of Research	2

Dual Degree Total = 102 Credit Hours

Shared Courses

M.Arch. II / M.S. Arch – Sustainable Building Technology Architecture, M.S. (Sustainable Building Technology Concentration)

The Architecture, M.S. - Sustainable Building Technology concentration allows 9 credits to be shared from the Master of Architecture II program as follows:

Degree Requirement(s)	ARC 2 Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7201 Research and Design Methods	3
ARCH 6050 Architecture Topics	ARCH 7104 Design Studio Diploma Project	6

Architecture, M.Arch. (ARC2 Concentration)

The Master of Architecture II program concentration allows 15 credits to be shared from the Architecture, M.S. - Sustainable Building Technology concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7800 Thesis Prep	3
	ARCH 7900 Thesis	6
ARCH 7102 Design Studio Topics	ARCH 7211 Research Lab	4
	GRAD 6302 Responsible Conduct of Research	2

Dual Degree Total = 66 Credit Hours

Shared Courses

M.Arch. Advanced Standing / M.S. Arch – Sustainable Building Technology Architecture, M.S. (Sustainable Building Technology Concentration)

The Architecture, M.S. - Sustainable Building Technology concentration allows 9 credits to be shared from the Master of Architecture AS program as follows:

Degree Requirement(s)	ARCAS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7201 Research and Design Methods	3
ARCH 6050 Architecture Topics	ARCH 7104 Design Studio Diploma Project	6

Architecture, M.Arch. (ARCAS Concentration)

The Master of Architecture AS program concentration allows 9 credits to be shared from the Architecture, M.S. – Sustainable Building Technology concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
ARCH 5050 Architecture Topics	ARCH 7800 Thesis Prep	3
	ARCH 7900 Thesis	6

Dual Degree Total = 52 Credit Hours

Grade Requirements

Students in the M.S. in Architecture and M.Arch. dual degree program are expected to earn a grade of A or B in all courses included in the curriculum and must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale). As per UNC Charlotte Graduate School Master's Degree Requirements, students must maintain "an overall GPA of 3.0 or above in courses on the degree plan of study. No more than six hours evaluated as C may be counted toward the minimum hours required for the master's degree." An accumulation of three C letter grades will result in the suspension of a student's enrollment in the program.

Master of Architecture (*Critical Heritage Studies Concentration*) and Master of Arts in Anthropology Dual Degree

The Critical Heritage / Anthropology dual degree builds upon these two complementary programs. Our faculty and students engage in a curriculum and research that seeks local solutions while engaging in global conversations; emphasizes hands-on engagement with communities and organizations; involves a range of approaches and practices of engaging with the past; and promotes the stories and sites that foreground the heritage of individuals of all backgrounds. In addition, we see the preservation and interpretation of the built environment as engaging discourses and practices surrounding other

tangible and intangible heritages happening in archaeological sites, museums, in communities, and elsewhere.

This dual degree seeks to increase the methodological perspectives and skill sets of anthropologists, archeologists, and heritage professionals by providing training that situates historic preservation and cultural resource management in a critical and transdisciplinary context, engages the global and local, and promotes experiential learning and community engagement.

Admission Requirements

Interested students should apply to the Master of Science in Architecture – Critical Heritage Studies concentration and be evaluated by the graduate admissions committee of the School of Architecture. In addition, students should apply for the Master of Arts in Anthropology and be evaluated by the graduate admissions committee of the Department of Anthropology.

Students must be admitted to both programs by the published census date of their third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Architecture, M.S. and History, M.A. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Architecture, M.S. – Critical Heritage concentration and Anthropology, M.A.) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Students enrolled in the Dual Degree M.S. Arch. – Critical Heritage Studies / M.A. Anthropology program are required to complete the capstones for each program, including the ARCH 6600 Heritage Colloquium (for the M.S.) and ANTH 6920 Thesis (for the M.A.)

Upon successful completion of all requirements, students receive both the Master of Science in Architecture degree and the Master of Arts in Anthropology.

Grade Requirements

Students in the M.S. in Architecture - Critical Heritage Studies and M.A. in Anthropology dual degree program are expected to earn a grade of A or B in all courses included in the curriculum and must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale). As per UNC Charlotte Graduate School Master's Degree Requirements, students must maintain "an overall GPA of 3.0 or above in courses on the degree plan of study." An accumulation of

three C letter grades will result in the suspension of a student's enrollment in the program.

Shared Courses

Architecture, M.S. Arch.: The Architecture, M.S. program – Critical Heritage Studies concentration allows 9 credits to be shared from Anthropology, M.A. as follows:

Degree Requirement(s)	ANTH Courses Allowed	Credits
Elective (choose from list)	ANTH 6601 – History of Anthropology	3
Elective (choose from list)	ANTH 6603, 6604, 6605, or 6606	6

Anthropology, M.A.: The Anthropology, M.A. program allows 9 credits to be shared from Architecture, M.S. - Critical Heritage concentration as follows:

Degree Requirement(s)	ARMS Courses Allowed	Credits
ANTH Elective	HIST 6320 – Historic Preservation	3
ANTH Elective	ARCH 7211 – Research Lab	4
ANTH Elective	ARCH 6600 – Heritage Colloquium	2

Dual Degree Total = 45 credit hours

Master of Architecture and Master of Arts in History (*Public History Concentration*) Dual Degree

The Critical Heritage / Public History dual degree builds upon these two complementary programs. Our faculty and students engage in a curriculum and research that seeks local solutions while engaging in global conversations; emphasizes hands-on engagement with communities and organizations; challenges authorized heritage discourses; diversifies approaches and practices of engaging with the past; and promotes the stories and sites that foreground the heritage of underrepresented communities. In addition, we see the preservation and interpretation of the built environment as interconnected with both social and environmental sustainability as well as engaging discourses and practices surrounding other tangible and intangible heritages happening in museums, archaeological sites, and elsewhere.

This dual degree seeks to diversify the field of heritage and public history professionals as well as the histories and heritages preserved by providing training that situates historic preservation in a critical and transdisciplinary context, engages the global and local, diversifies approaches and practices, and promotes experiential learning, community engagement, and social and environmental sustainability.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See the Architecture, M.S. and History, M.A. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Architecture, M.S. – Critical Heritage concentration and History, M.A. – Public History concentration) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Students enrolled in the Dual Degree M.S. Arch. – Critical Heritage Studies / M.A. History – Public History program are required to complete the capstones for each program, including the ARCH 6600 Heritage Colloquium (for the M.S.) and HIST 6999 Thesis (for the M.A.)

Upon successful completion of all requirements, students receive both the Master of Science in Architecture degree and the Master of Arts in History.

Shared Courses

Architecture, M.S., Arch.

The Architecture, M.S. program - Critical Heritage Studies concentration allows 9 credits to be shared from History, M.A. - Public History concentration as follows:

Degree Requirement(s)	HIST Course(s) Allowed	Credits
Elective (choose from list)	HIST 6310 - Museum Studies	3
Elective (choose from list)	HIST 6300 - Topics in Public History	3
Elective (choose from list)	HIST 6693 - Historiography and Methodology	3

History, M.A.

The History, M.A. program - Public History concentration

allows 9 credits to be shared from Architecture, M.S. – Critical Heritage concentration as follows:

Degree Requirement(s)	ARMS Course(s) Allowed	Credits
HIST 6320	HIST 6320 - Historic Preservation	3
HIST 6400	ARCH 6400 - Architecture Internship	3
HIST 6330	HIST 6330 - History in the Digital Age	3

Dual Degree Total = 48 Credit Hours

Grade Requirements

Students in the M.S. in Architecture - Critical Heritage Studies and M.A. in History - Public History dual degree program are expected to earn a grade of A or B in all courses included in the curriculum and must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale). As per UNC Charlotte Graduate School Master's Degree Requirements, students must maintain "an overall GPA of 3.0 or above in courses on the degree plan of study." An accumulation of three C letter grades will result in the suspension of a student's enrollment in the program.

Master of Architecture and Urban Design Dual Degree

The curriculum for the dual M.Arch./M.U.D. degree is noted below. Students admitted to this program typically are enrolled in M.Arch. courses for their first year, and study in M.U.D. program in their second year and participate in the M.U.D. summer program, and be enrolled in M.Arch. courses for their final year to complete their dual-degree program.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Architecture, M. Arch. and Urban Design, M.U.D. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Architecture, M.Arch. and Urban Design, M.U.D.) with the added benefit of sharing a limited number

of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Architecture, M.S. Arch. (AS Concentration)

The Architecture, M.S. program (AS Concentration) allows 9 credits to be shared from Urban Design, M.U.D. as follows:

Degree Requirement(s)	MUD Course(s) Allowed	Credits
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	MUDD 5601	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	MUDD 7120	6

Urban Design, M.U.D.

The Urban Design, M.U.D. program allows 3 credits to be Shared from Architecture, M.Arch. (AS Concentration) as follows:

Degree Requirement(s)	ARC2 Course(s) Allowed	Credits
MUDD 6050	ARCH 7201	3

M.Arch. AS / M.U.D. Dual Degree Total = 64 Credit Hours

Architecture, M.S. Arch. (ARC2 Concentration)

The Architecture, M.S. program (ARC2 Concentration) allows 15 credits to be shared from Urban Design, M.U.D. as follows:

Degree Requirement(s)	MUD Course(s) Allowed	Credits
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	MUDD 5601	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	MUDD 7120	6
ARCH 7102	MUDD 6102	6

Urban Design, M.U.D.

The Urban Design, M.U.D. program allows 3 credits to be Shared from Architecture, M.Arch. (ARC2 Concentration) as follows:

Degree Requirement(s)	ARC2 Course(s) Allowed	Credits
MUDD 6050	ARCH 7201	3

M.Arch. II / M.U.D. Dual Degree Total = 78 Credit Hours

Architecture, M.S. Arch. (ARC1 Concentration)

The Architecture, M.S. program (ARC1 Concentration) allows 15 credits to be shared from Urban Design, M.U.D. as follows:

Degree Requirement(s)	MUD Course(s) Allowed	Credits
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	MUDD 5601	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	MUDD 7120	6
ARCH 6103	MUDD 6102	6

Urban Design, M.U.D.

The Urban Design, M.U.D. program allows 3 credits to be Shared from Architecture, M.Arch. (ARC1 Concentration) as follows:

Degree Requirement(s)	ARC2 Course(s) Allowed	Credits
MUDD 6050	ARCH 7201	3

M.Arch. II / M.U.D. Dual Degree Total = 114 Credit Hours

Capstone Studios and Final Diploma Project

Students enrolled in the Dual Degree M.Arch./M.U.D. program are required to complete the M.U.D. Capstone Studio (MUDD 7102) and the Architectural Diploma Studio (ARCH 7104).

Graduate Advising

A critical component of any successful graduate program is academic advising and guidance during the course of a student's program of study. The primary advisors for all urban design graduate students in the School of Architecture will be the Associate Director of the School of Architecture, in consultation with the Director of the Urban Design Program.

Transfer Credit

Transfer credit may be granted under special circumstances (e.g., approved post-baccalaureate status prior to entry into the program).

Waiver Credit

Waiver credit may be allowed if a student can demonstrate that a course or courses taken in his or her prior undergraduate or graduate curriculum equals or exceeds in both content and rigor of a course or courses required in the graduate curriculum. If a required course in the curriculum is waived, the student will be allowed to fill those credit hours with another course as advised by the Associate Director of the School of Architecture, in consultation with the Director of the Urban Design Program.

Application for Degree

In order to meet UNC Charlotte's Graduate School requirements for degree candidacy, all graduate students must complete and pass coursework involving capstone projects. For urban design students, this comprises completion of the two Summer design studios. For dual degree students, this includes the urban design capstone as well as completion of an architectural diploma project in the final year. Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Research and Study Abroad Opportunities

M.U.D. and Dual Degree students may engage in research activities via the School of Architecture's City Building Lab (CBL). All students automatically obtain international study experience through the required global Summer studio.

Assistantships, Tuition Differentials, and Scholarships

A number of research assistantships, scholarships, and tuition waivers are available to M.U.D. candidates. No separate assistantship application is necessary; awards are based on application materials to the program, and award decisions are based on the applicant's academic merit or promise of academic merit, and/or on demonstration of need.

Master of Architecture and Urban Design Dual Degree

The Critical Heritage / Urban Design dual degree builds upon these two complimentary programs.

The Urban Design program foregrounds Charlotte's social, economic, environmental, and ethical design challenges and prioritizes tactical insertions within urban ecosystems through active engagement with community stakeholders.

The Critical Heritage program challenges authorized heritage discourse, diversifies approaches and practices of engaging with the past; and sees preservation and interpretation of the built environment as interconnected with interdisciplinary discourses surrounding other tangible and intangible heritages.

Together, the faculty and students participating in the dual degree engage in a curriculum and research that seeks local solutions while engaging in global conversations and that emphasize hands-on engagement with communities and organizations to create places, save spaces, and share stories that foreground the heritage of underrepresented communities.

This dual degree seeks to diversify the field of heritage and urban design professionals through an exploration of the intersection between the approaches and practices of these fields and through the promotion of experiential learning, community engagement, and social and environmental sustainability.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See the Architecture, M.S. and Urban Design, M.U.D. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Architecture, M.S. – Critical Heritage concentration and Urban Design, M.U.D.) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Students enrolled in the Dual Degree M.S. Arch. – Critical Heritage Studies / Urban Design, M.U.D. program are required to complete the capstones for each program, including the ARCH 6600 Heritage Colloquium (for the M.S.) and MUDD 7102 Urban Design Studio (for the M.U.D.).

Upon successful completion of all requirements, students receive both the Master of Science in Architecture degree and the Master of Science in Urban Design.

Shared Courses

Architecture, M.S., Arch.

The Architecture, M.S. program - Critical Heritage Studies concentration allows 9 credits to be shared from Urban Design, M.U.D. program as follows:

Degree Requirement(s)	MSIT Course(s) Allowed	Credits
Elective (choose from list)	MUDD 5601 - Community Planning Workshop	3
Elective (choose from list)	MUDD 7120 – Graduate Summer International Study	6

Urban Design, M.U.D.

The Urban Design, M.U.D. program allows 6 credits to be shared from Architecture, M.S. - Critical Heritage Studies concentration as follows:

Degree Requirement(s)	ARC2 Course(s) Allowed	Credits
MUDD 6205	ARCH 5600 – Critical Approaches to Heritage	3
MUDD 6050	HIST 6320 – Historic Preservation	3

Dual Degree Total = 51 Credit Hours

Grade Requirements

Students in the M.S. in Architecture - Critical Heritage Studies and Urban Design, M.U.D. dual degree program are expected to earn a grade of A or B in all courses included in the curriculum and must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale). As per UNC Charlotte Graduate School Master's Degree Requirements, students must maintain "an overall GPA of 3.0 or above in courses on the degree plan of study." An accumulation of three C letter grades will result in the suspension of a student's enrollment in the program.

Master of Architecture and M.S. in Information Technology Dual Degree

Design has become increasingly important to computer scientists and at the same time computation has become important to designers. The dual degree program in Architecture and Information Technology program is a unique curriculum that systematically combines the strength and insights of these disciplines. Students in this dual degree program enroll simultaneously in both degree programs.

As computing has matured as a discipline, it has expanded

its focus to include the physical and virtual settings in which users interact with the machine. Specialties like human computer interaction, ubiquitous computing, gaming, and visualization require an understanding not only of the logic of the machine, but also the logic of the user. Based on these concerns, the design thinking ability that is an integral part of design training is of interest as an alternative paradigm that may change the way that students think and operate.

Within architecture, there is a unique opportunity to develop students who will have the knowledge to lead the integration of the computer into architectural practice and research. As firms rely more and more on computation, those who know how to think, program, and script will be able to change the way architects design and practice. We see the day fast approaching when the IT department at firms is not separate but rather is at the core of what architects do. Already, in advanced practices across the world, computing and design are intermingling.

The curriculum integrates architecture students with information technology students, working collaboratively on tasks that challenge both fields. Early in the curriculum, the cohorts with architecture background and those with computing background take courses to provide basic competency in a new discipline.

A two-semester sequence of studio lab courses focuses on issues and problems that are researched by design teams.

Note: The Master of Architecture in the School of Architecture is fully accredited through the National Architectural Accrediting Board (NAAB). The architecture curriculum included in this dual degree program meets all NAAB professional degree requirements needed for licensure as a registered architect.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Architecture, M.Arch. and Information Technology, M.S. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Architecture, M.S. (Design Computation concentration) and Information Technology, M.S. (Human Centered Design concentration) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Students enrolled in the Dual Degree M.S. Arch. (Design Computation) / M.S. Information Technology (Human-Centered Design) program are required to complete the capstones for each program, including the M.S.IT Capstone (IT Project) and the Architectural Thesis (ARCH 7900).

Upon successful completion of all requirements, students receive both the Master of Architecture degree and the M.S. in Information Technology degree.

Shared Courses (M.Arch. Advanced Standing)

Architecture, M.Arch. (Advanced Standing Concentration)

The Architecture, M.Arch. (Advanced Standing concentration) program allows 9 credits to be shared from Information Technology, M.S. as follows:

Degree Requirement(s)	MSIT Course(s) Allowed	Credits
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITCS 5122	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITIS 6200	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITIS 6300	3

Information Technology, M.S. (Human-Centered Design Concentration)

The Information Technology, M.S. program allows 9 credits to be shared from Architecture, M.Arch. (Advanced Standing concentration) as follows:

Degree Requirement(s)	ARC1 Course(s) Allowed	Credits
Concentration - ARCH 7211	ARCH 5305	3
Electives - Any ITIS	ARCH 7104	6

Dual Degree Total = 52 Credit Hours

Shared Courses (ARC2 Concentration)

Architecture, M.Arch. (ARC2 Concentration)

The Architecture, M.Arch. (ARC2 concentration) program allows 15 credits to be shared from Information Technology, M.S. as follows:

Degree Requirement(s)	MSIT Course(s) Allowed	Credits
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITCS 5122	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITIS 6200	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITIS 6300	3
ARCH 7102	ITIS 5166 and ITIS 6120	6

Information Technology, M.S. (Human-Centered Design Concentration)

The Information Technology, M.S. program allows 9 credits to be shared from Architecture, M.Arch. (ARC2 concentration) as follows:

Degree Requirement(s)	ARC2 Course(s) Allowed	Credits
Concentration - ARCH 7211	ARCH 5305	3
Electives - Any ITIS	ARCH 7104	6

Dual Degree Total = 66 Credit Hours

Shared Courses (ARC1 Concentration)

Architecture, M.Arch. (ARC1 Concentration)

The Architecture, M.Arch. (ARC1 concentration) program allows 15 credits to be shared from Information Technology, M.S. as follows:

Degree Requirement(s)	MSIT Course(s) Allowed	Credits
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITCS 5122	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITIS 6200	3
ARCH elective (ARCH 5050, ARCH 5060, ARCH 6306, or ARCH 6890)	ITIS 6300	3
ARCH 7102	ITIS 5166 and ITIS 6120	6

Information Technology, M.S. (Human-Centered Design Concentration)

The Information Technology, M.S. program allows 9 credits to be shared from Architecture, M.Arch (ARC1 concentration) as follows:

Degree Requirement(s)	ARC1 Course(s) Allowed	Credits
Concentration - ARCH 7211	ARCH 5305	3
Electives - Any ITIS	ARCH 7104	6

Dual Degree Total = 102 Credit Hours

Capstone Studios and Final Diploma Project

Students enrolled in the Dual Degree M.Arch. /M.S. Information Technology program are required to complete the M.S.I.T Capstone (IT Project) and ARCH 7104 - Design Studio Diploma Project.

M.S. in Architecture and M.S. in Information Technology Dual Degree

Design has become increasingly important to computer scientists, and at the same time computation has become important to designers. The Master of Science in Architecture and Master of Science in Information Technology dual degree program is a unique curriculum that systematically combines the strength and insights of these disciplines. Students enroll simultaneously in these two M.S. degree programs.

As computing has matured as a discipline, it has expanded its focus to include the physical and virtual settings in which users interact with the machine. Specialties like human computer interaction, ubiquitous computing, gaming, and visualization require an understanding not only of the logic of the machine, but also the logic of the user. Based on these concerns, the design thinking ability that is an integral part of design training is of interest as an alternative paradigm that may change the way that students think and operate.

Within architecture and its allied fields, there is a unique opportunity to develop students who will have the knowledge to lead the integration of the computer into architectural research. As firms rely more and more on computation, those who know how to think, program, and script will be able to change the way architects design and practice. We see the day fast approaching when the

IT department at firms is not separate but rather is at the core of what architects do. Already, in advanced practices across the world, computing and design are intermingling.

The curriculum integrates M.S. in Architecture students with M.S. in Information Technology students, working collaboratively on tasks that challenge both fields. A two-semester sequence of studio lab courses focuses on issues and problems that are researched by design teams.

Note: The Master of Science in Architecture, because of its research focus, is not a NAAB accredited program that can lead to licensure as a registered architect. The School of Architecture does offer a NAAB accredited Master of Architecture, which is a separate degree program.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Architecture, M.S. and Information Technology, M.S. sections of this catalog for individual program admission requirements.

Shared Courses***Architecture, M.S. Arch.***

The Architecture, M.S. program (Design Computation Concentration) allows 9 credits to be shared from Information Technology, M.S. as follows:

Degree Requirement(s)	MSIT Course(s) Allowed	Credits
ARCH elective (ARCH 5050, ARCH 5204, ARCH 6306, or ARCH 6890)	ITCS 5122	3
ARCH elective (ARCH 5050, ARCH 5204, ARCH 6306, or ARCH 6890)	ITIS 6200	3
ARCH elective (ARCH 5050, ARCH 5204, ARCH 6306, or ARCH 6890)	ITIS 6300	3

Information Technology, M.S.

The Information Technology, M.S. program (Human-Centered Design concentration) allows 9 credits to be shared from Architecture, M.S. (Design Computation concentration) as follows:

Degree Requirement(s)	ARC2 Course(s) Allowed	Credits
Concentration - ARCH 7211	ARCH 7211	3
Electives - Any ITIS	ARCH 7900	6

Dual Degree Total = 42 Credit Hours

Capstone Requirements

Students enrolled in the Dual Degree M.S. Architecture-Design Computation/ M.S. Information Technology-Human Centered Design are required to complete the capstones for both programs, including the IT Project (M.S.I.T Capstone) and ARCH 7900 - Thesis.

Grade Requirements

Students in the M.S. in Architecture (Design Computation concentration) and M.S. in Information Technology (Human-Centered Design) dual degree program are expected to earn a grade of A or B in all courses included in the curriculum and must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale). As per UNC Charlotte Graduate School Master's Degree Requirements, students must maintain an overall GPA of 3.0 or above in courses on the degree plan of study. No more than six hours evaluated as C may be counted toward the minimum hours required for the master's degree. An accumulation of three C letter grades will result in the suspension of a student's enrollment in the program.



Belk College of Business

belkcollege.charlotte.edu

The Belk College of Business is accredited by AACSB International, the premier accrediting agency for academic programs in business administration and accounting. The Belk College offers challenging master's programs in Accountancy, Business Administration, Economics, Management, Mathematical Finance, and Real Estate that provide graduates with the tools they need to succeed in business. Courses are taught by faculty whose research is published in top-level journals and whose expertise is highly sought after by industry executives. Students have the opportunity to network with professionals from a variety of fields, and interact with alumni and leaders from Charlotte's dynamic business community. These programs provide flexible schedules with courses offered both at UNC Charlotte's main campus and at the Dubois Center in the heart of Charlotte's Uptown Business District, so that working professionals may earn a graduate degree without interrupting their careers.

College of Business Graduate Degree Programs

- Doctor of Business Administration
- Ph.D. in Business Administration
- Master of Accountancy
- Master of Business Administration
- Master of Science in Economics
- Master of Science in Management
- Master of Science in Real Estate

Interdisciplinary Degree Programs

- M.S. in Data Science and Business Analytics (*see the "School of Data Science" section of this Catalog*)
- Dual MBA with specialization in Global Business and Strategy (*in conjunction with the Graduate School of Business Administration and Leadership (EGADE) at Tecnológico de Monterrey*)
- MBA/MHA Dual Degree (*in collaboration with the College of Health and Human Services*)
- M.S. in Economics/M.Sc. in Economics Dual Degree (*in conjunction with Universität Regensburg*)
- M.S. in Mathematical Finance (*The Departments of Finance and Economics in the Belk College of Business collaborate with the Department of Mathematics and Statistics in the College of Science in this interdisciplinary program*)
- M.S. in Mathematical Finance/MBA Dual Degree
- M.S. in Mathematical Finance/M.S. in Economics Dual Degree
- M.S. in Mathematical Finance/Laurea Magistrale (LM) in Banking and Finance Dual Degree (*in conjunction with Università Cattolica del Sacro Cuore (UCSC)*)
- M.S. in Mathematical Finance/Master's in Finance Dual Degree (*in conjunction with Shanghai University of Finance and Economics (SUFU)*)
- M.S. in Mathematical Finance/Master's in Quantitative Finance Dual Degree (*in conjunction*)

with College of Technology Management at National Tsing Hua University (NTHU))

- M.S. in Real Estate/MBA Dual Degree
- Ph.D. in Computing and Information Systems - Business Track
(The Belk College collaborates with the College of Computing & Informatics on the Business Track in this multidisciplinary program, located in the "College of Computing and Informatics" section of this Catalog)
- Ph.D. in Organizational Science
(Faculty from the Belk College's Department of Management teach in this multidisciplinary program, located in the "College of Humanities & Earth and Social Sciences" section of this Catalog)
- Ph.D. in Public Policy
(Faculty from the Belk College's Department of Economics teach in this multidisciplinary program, located in the "College of Liberal Arts & Sciences" section of this Catalog)

Graduate Non-Degree Programs

- MBA PLUS Post-Master's Certificate
- Graduate Certificate in Applied Econometrics
- Graduate Certificate in Business Analytics
- Graduate Certificate in Data Science and Business Analytics (see the "College of Computing and Informatics" section of this Catalog)
- Graduate Certificate in Corporate Venturing
- Graduate Certificate in Global Business and Strategy (in conjunction with the MBA in Global Business and Strategy Dual Degree)
- Graduate Certificate in Real Estate and Development

ACCOUNTANCY

• Master of Accountancy (MACC)

- Financial Accounting/Auditing
- Professional Accounting
- Tax
- Individualized

Turner School of Accountancy

macc.charlotte.edu

Master of Accountancy

The Master of Accountancy (MACC) program is a multiple concentration program designed to prepare accountants for the rapidly changing expectations of the accounting profession. The program has three concentrations: (1) Professional Accounting, (2) Financial Accounting/Auditing, and (3) Tax. The program also includes the option for development of an individualized program of study. Completion of the Professional Accounting concentration or the Financial Accounting/Auditing concentration enables students to pursue licensure in states requiring 150 credit hours.

Admission Requirements

The MACC program is designed for students who have completed an undergraduate degree or equivalent in accounting from a U.S. University.

In addition to the general requirements for admission to the Graduate School, an acceptable score on the verbal and quantitative portions of the Graduate Management Admission Test (GMAT) is required for graduate study in Accounting. A Graduate Record Exam (GRE) score may be submitted instead of a GMAT score.

The GMAT/GRE application requirement may be waived for applicants meeting the following criteria:

- UNC Charlotte undergraduate accounting students: 3.0 or higher undergraduate GPA (UGPA), 3.0 or higher UGPA from 3000 and 4000 accounting level courses, and must also provide letters of recommendation from three 3000 and/or 4000 accounting professors
- Undergraduate accounting majors at other universities: 3.0 or higher undergraduate GPA (UGPA), 3.0 or higher UGPA from upper-level accounting level courses, and must also provide letters of recommendation from three upper-level accounting professors.

Waivers must be requested from the Master of Accountancy Graduate Program Director when submitting the completed application. All GMAT/GRE waivers are at the discretion of the Master of Accountancy Graduate Program Director. If candidates are unable to secure the GMAT/GRE waiver, they will be required to submit official GMAT/GRE test scores in their Master of Accountancy application.

Degree Requirements

The program leading to the Master of Accountancy degree consists of 30 credit hours (10 classes) of graduate coursework. The coursework is divided into three components: required classes, elective classes, and a capstone class.

Required Classes

The following classes are required:

ACCT 6121 – Business Tax I (3)

ACCT 6220 – Financial Statement Auditing (3)

ACCT 6281 – Advanced Financial Reporting and Analysis I (3)

ACCT 6340 – Accounting Data Analytics (3)

Elective Course Requirement

Additional elective classes are available from the MACC program. These courses are listed below. Classes from other graduate programs offered by the Belk College of Business may also be taken with the permission of the MACC Program Director. A student may request to take electives from outside of the Belk College of Business. This request must be approved by the Program Director of the MACC program along with the Program Director offering

the requested class. A total of five elective classes must be completed.

The following MACC classes can be taken as electives:

ACCT 6122 - Business Tax II (3)

ACCT 6160 - Advanced Individual Taxation (3)

ACCT 6199 - Topics in Taxation (1 to 4)

ACCT 6262 - Advanced Financial Reporting and Analysis II (3)

ACCT 6291 - Financial Statement Analysis (3)

ACCT 6299 - Topics in Financial Accounting and Auditing (1 to 4)

ACCT 6890 - Directed Individual Study (3)

ACCT 6150 - Tax Strategy and Policy (3)

ACCT 6271 - Accounting Research and Communication (3)

Capstone Class Requirement

All students must take a capstone class. Choose one of the following to meet this requirement. Note: The course not taken for capstone credit may be taken as an elective.

ACCT 6150 – Tax Strategy and Policy (3)

ACCT 6271 – Accounting Research and Communication (3)

Degree Total = 30 Credit Hours

Advising

Before, or concurrent with, the start of the first semester of study, students are expected to complete a program of study listing each course they expect to take as a part of the program.

Application for Degree

Students should make an application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Assistantships

Assistantships are available on a competitive basis.

Program Certifications/Accreditation

The Belk College of Business and the Turner School of Accountancy are accredited by The Association to Advance Collegiate Schools of Business (AACSB International).

BUSINESS ADMINISTRATION

- Doctor of Business Administration (DBA)
- Ph.D. in Business Administration
- Master of Business Administration (MBA)
 - Applied Investment Management
 - Business Analytics
 - Business Finance
 - Digital Marketing
 - Energy
 - Entrepreneurship and Corporate Venturing
 - Financial Institutions/Commercial Banking
 - Global Business
 - Information and Technology Management
 - Innovation and Growth Strategies
 - Management
 - Marketing
 - Real Estate Finance and Development
 - Supply Chain Management
 - Student Structured
- MBA/MHA Dual Degree (*in collaboration with the College of Health and Human Services*)
- MBA/M.S. in Mathematical Finance Dual Degree (*see the Mathematical Finance section*)
- MBA/M.S. in Real Estate Dual Degree (*see the Real Estate section*)
- Dual MBA Degree (*in conjunction with the Graduate School of Business and Leadership (EGADE) (See the Global Business section)*)
- MBA PLUS Post-Master's Certificate
- Graduate Certificate in Business Analytics
- Graduate Certificate in Corporate Venturing

Doctor of Business Administration (DBA)

Graduate Program

dba.charlotte.edu

The Doctor of Business Administration (DBA) is a professional degree taught in an executive format designed to prepare graduates for leadership positions in organizations and teaching careers in academia. The program focuses on research methodology with practice-focus content and projects that address issues confronting contemporary business leaders. Students gain an advanced level of knowledge in the following major fields: management, marketing, operations management and information systems. In addition, students are expected to demonstrate mastery of the existing body of knowledge in their major field and to develop new knowledge through original independent research. With the educational background provided by the program, graduates are qualified to lead organizations as senior executives and change agents, acquire faculty positions in academic institutions, and launch successful careers in management consulting.

Admission Requirements

All applicants seeking admission to the DBA program must fulfill the University's general requirements for graduate admission at the Ph.D. level. Additional requirements for admission into the program include:

- An earned MBA or master's degree in a related field from a college or university accredited by an accepted accrediting body with a minimum GPA of at least 3.0 on a 4.0 scale
- Five or more years of professional working experience
- For non-native speakers of English, a score of 557 on the paper-based TOEFL, a score of 83 on the internet-based TOEFL, or a band score of 6.5 on the IELTS
- Three positive letters of recommendation
- Two essays: one addressing the candidate's goals and motivations for pursuing the DBA and the second outlining the candidate's general areas of research interest
- Other credentials as required by the Graduate school or the executive DBA program committee

Students are admitted to the program by the Dean of the Graduate School based on the recommendation of the Belk College of Business DBA Program Director, in consultation with the Belk College of Business DBA Program Committee. Recommendations are based on the assessments of the Program Director and Program

Committee of the candidate's ability to complete the program, as supported by the application materials. If there are more candidates than can be accommodated, candidates are recommended in order of their perceived ability, promise of success, and suitability to the program.

Degree Requirements

The degree of Doctor of Business Administration is awarded for completion of scholarly research that advances knowledge in the fields of business theory or practice. Evidence of this is demonstrated by a successful dissertation defense. Additionally, recipients of this degree must demonstrate mastery of the body of knowledge within the field and potential for success in future leadership positions and academia.

The DBA is a three-year (six-semester), lockstep program consisting of 18 three-credit hour courses. The program requires 54 post-master's credit hours. The curriculum has three major components:

Research Methodology Courses (21 credit hours)

- BDBA 8100 - Introduction to Experimental Design and Measurement (3)
- BDBA 8130 - Introduction to Business Theory (3)
- BDBA 8140 - Advanced Business Theory (3)
- BDBA 8150 - Business Statistics and Data Analysis (3)
- BDBA 8200 - Research Methods I (3)
- BDBA 8230 - Research Methods II (3)
- BDBA 8350 - Dissertation Proposal Development (3)

Seminars in Applied Research (15 credit hours)

- BDBA 8110 - Organizational Theory and Systems (3)
- BDBA 8120 - Professional Issues I (3)
- BDBA 8210 - Current Topics Research Seminar (3)
- BDBA 8220 - Professional Issues II (3)
- BDBA 8240 - Focused Research Seminar (3)

Note: BDBA 8100, BDBA 8110, and BDBA 8120 fulfill the Responsible Conduct of Research (RCR) requirement for DBA students.

Dissertation (18 credit hours)

- BDBA 8999 - Doctoral Dissertation Research (1 to 9)

Degree Total = 54 Credit Hours

Grade Requirements

Students are expected to earn an A or B in all courses included in the program and must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale) to graduate. The dissertation is graded on a Pass/Unsatisfactory basis and, therefore, is not included in the cumulative average. An accumulation of two C grades or one U grade will result in termination from the program.

Dissertation Advisor and Advisory Committee

Every student in the program must have a Dissertation Advisor and an Advisory Committee prior to being admitted to Candidacy. Students should select a dissertation advisor before the end of the second year of the program. Students and their dissertation advisor jointly determine the advisory committee. The Dissertation Advisor serves as Chair of the Advisory Committee and must be a member of the Graduate Faculty of Belk College of Business UNC Charlotte. The Advisory Committee must have at least four members, three of which are chosen by the student. Normally, the Dissertation Chair will be graduate faculty of the Belk College from the Departments of Business Information Systems and Operations Management, Management, or Marketing. Advisory Committee members must be members of the graduate faculty at UNC Charlotte or from other institutions or industry provided they have relevant expertise and background. Committee members should reflect both content and methods expertise needed for the student to complete the research.

Admission to Candidacy

The dissertation topic may be proposed after students have completed the required coursework. The proposal defense serves as the qualifying exam. Pursuant to Graduate School rules, doctoral students advance to candidacy after their Advisory Committee and the Dean of the Graduate School approve the dissertation topic. Further pursuant to Graduate School rules, candidacy must be achieved at least six months before the degree is conferred.

Dissertation

Students must complete and defend a dissertation based on a research program approved by their Dissertation Advisor and Advisory Committee which results in a high-quality, original, and substantial piece of research. Students must orally present and defend the dissertation before the Advisory Committee in a defense that is open to the University community. A copy of the dissertation must be made available to the Graduate Faculty of the Belk College of Business at least three weeks prior to the public defense. While the defense is open to the University community, the deliberations of the Advisory Committee are held in Executive Session. The dissertation is graded on a Pass/Unsatisfactory basis by the Advisory Committee and the Dean of the Graduate School.

The dissertation defense is the final examination. It is a Graduate School requirement that students who fail the final examination twice are terminated from the program.

Residency Requirement

The DBA is a cohort-based program offered in an executive format. Normally students must enroll for nine credit hours during each semester of the regular academic year (i.e., fall and spring). Students may petition the Program Director for permission to enroll in less than nine semester hours in cases of hardship or other emergencies. It is a Graduate School requirement that a student must enroll in at least 18 total credit hours of Dissertation Research in order to graduate from the program.

Students that have completed all degree requirements, including the Dissertation Defense, may enroll once in GRAD 9999 (Doctoral Graduate Residency Credit) in order to meet Graduate School Residency requirements.

Time Limit for Degree Completion

Students are allowed a maximum of eight calendar years from formal admission to the DBA program to complete the program successfully.

Application for Degree

Students should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Ph.D. in Business Administration

Graduate Program

phd-business.charlotte.edu

The Ph.D. in Business Administration is a research-oriented program designed to prepare graduates for teaching and research careers in academia. The program includes core courses covering all business specialties combined with an in-depth study in both theoretical and empirical aspects. Students also receive training in pedagogy. Students are expected to demonstrate mastery of the existing body of knowledge and to develop new knowledge through original independent research. With the educational background provided by the program, graduates are qualified for tenure-track professor positions at both national and international research and teaching universities and other educational institutions.

Admission Requirements

All applicants seeking admission into the Ph.D. in Business Administration must fulfill the University's general requirements for graduate admission at the Ph.D. level. Additional requirements for admission into the program are listed below.

- 1) A baccalaureate or master's degree in Business, Economics, or a related field with a minimum

undergraduate GPA of 3.5 (A=4.0) overall. In the case a candidate presents a master's degree at application, a minimum graduate GPA of 3.25 (A=4.0) on all graduate coursework is required.

- 2) A GMAT score of at least 650 or GRE scores with scores on the quantitative section of at least 700 and on the verbal section of at least 500.
- 3) For non-native speakers of English that do not hold degrees from a U.S. university, a score of 557 on the paper-based TOEFL, or 85% on the MELAB.
- 4) Non-native speakers of English may be required, at the discretion of the Graduate School or the Program Director for the Ph.D. in Business Administration, to enroll in English as a Second Language (ESL) courses at the English Language Training Institute.
- 5) Three positive letters of recommendation, one of which must be from a former professor.
- 6) A Statement of Purpose from the applicant explaining why they wish to pursue a Ph.D. in Business Administration and why they wish to study the specific area to which they are applying.
- 7) To ensure their preparation for doctoral coursework, students may be required to take additional undergraduate or graduate courses, as determined by the Ph.D. in Business Administration Program Committee and the Program Director. Such courses will be specified at the time of admission into the program and may include courses in finance, economics, accounting, marketing, management, operations management, management information systems, mathematics, or statistics.

Students are admitted to the program by the Dean of the Graduate School based on the recommendation of the Belk College of Business Doctoral Program Director, in consultation with the Belk College of Business Doctoral Program Committee. Recommendations are based on the assessments of the Program Director and the Program Committee of the candidate's ability to complete the program, as supported by the application materials. The Program Director, in consultation with the Program Committee, may waive certain requirements if they judge the candidate to be capable of completing the program. If there are more candidates than can be accommodated, candidates are recommended in order of their perceived ability, promise of success, and suitability to the program.

Degree Requirements

The degree of Doctor of Philosophy in Business Administration is awarded for completion of scholarly research that advances knowledge in the field of research. Evidence of this is demonstrated by a successful dissertation defense. Additionally, recipients of this degree must demonstrate mastery of the body of knowledge within the field and potential for success in future teaching and research.

Students that enter the program must work with the Graduate Program Director to develop a Plan of Study during their first two semesters in the program. This Plan of Study determines the exact coursework that the student must meet in order to be eligible to take the Qualifying Examination. The Plan of Study must meet all Graduate School and Belk College of Business requirements. The Graduate School requires that any student earning a Ph.D. must complete at least 72 post-baccalaureate credit hours, including at least 18 hours of dissertation credit. Some of these graduate credit hours may include courses taken while enrolled in other graduate programs. It is a Belk College of Business requirement that any program of study within the Ph.D. in Business Administration must contain at least 42 credit hours of doctoral coursework, regardless of other graduate hours that the student may have previously earned. These 42 credit hours are in addition to the minimum 18 hours of dissertation credit that the Graduate School requires. The Plan of Study must contain a minimum of 33 credit hours in finance and economics courses and a minimum of 9 credit hours in research support courses.

In addition to the general requirements above, if a student enters the program with only a Bachelor's degree, the Plan of Study must include an additional 30 credit hours of coursework. This coursework must be taken at the graduate level and will generally include courses that are part of the Master of Accountancy, Master of Business Administration, Master of Science in Economics, or Master of Science in Mathematical Finance programs. These 30 credit hours of additional coursework are subject to the approval of the Graduate Program Director.

To ensure that all students are ready for doctoral courses in Business Administration, the program has two distinct sets of prerequisites. First, students entering the program must either demonstrate or attain proficiency in each of the business specialties. Second, students must also demonstrate or attain mathematical proficiency. Students entering the program will be evaluated for these proficiencies by the Graduate Program Director. If a student is found to be deficient, then the Plan of Study must include appropriate courses, as determined by the Graduate Program Director, from the Business Core and Mathematical prerequisites listed below. These courses are in addition to the finance, economics, and research support courses.

Business Core Courses

To ensure their preparation for doctoral level coursework in all business specialties, students must demonstrate proficiency in the Business Core. Students may satisfy this requirement either by taking the following courses or by having previously taken equivalent courses:

MBAD 6152 - Financial Management (0 to 3)
 MBAD 6194 - Global Strategic Management (0 to 3)
 MBAD 6270 - Marketing Management (0 to 3)

Students who lack sufficient preparation in accounting, economics, or information systems may, at the discretion of the Graduate Program Director, be required to complete one or more 5000-level business courses in these disciplines. For the 6000-level courses listed above, only graduate courses may count as equivalent courses. However, students may, at the discretion of the Graduate Program Director, be permitted to take other 6000-level or higher-level courses in place of those listed above if the student's background indicates that this would benefit the student.

Prerequisite Mathematics Courses

Finance and economics are mathematically intensive fields. To ensure that students are prepared for doctoral level coursework, they are required to have had, at the graduate or undergraduate level, the equivalent of the following courses:

MATH 1241 - Calculus I (3)
 MATH 1242 - Calculus II (3)
 MATH 2164 - Matrices and Linear Algebra (3)
 MATH 2241 - Calculus III (3)
 MATH 3122 - Probability and Statistics I (3)
 MATH 3123 - Probability and Statistics II (3)

Students lacking these mathematics courses will generally be allowed to take those courses at either the graduate or undergraduate level. At the Graduate Program Director's discretion, a student may be permitted to take combined courses to meet multiple prerequisites.

Although unlikely, it is possible that a student may enter the program without having taken a specific prerequisite or business core course but has, nevertheless, acquired the same skill and technical abilities that the course would convey. In such cases, the Graduate Program Director may waive the course.

Students who lack strong computer programming skills may be advised to take programming courses offered by the College of Computing and Informatics. Specifically, the Graduate Program Director may advise a student to take ITSC 1212 (Introduction to Computer Science I) or other similar courses after reviewing the student's background and prior programming experience.

Finance and Economics Courses (33 credit hours)

The Plan of Study must consist of a minimum of six courses in finance and five courses in economics. Typically, these courses are:

BPHD 8100 - Microeconomic Theory I (3)

BPHD 8110 - Microeconomic Theory II (3)
 BPHD 8120 - Econometrics I (3)
 BPHD 8130 - Econometrics II (3)
 BPHD 8140 - Econometrics III (3)
 BPHD 8200 - Financial Economic Theory I (3)
 BPHD 8210 - Investments and Portfolio Theory (3)
 BPHD 8220 - Financial Economic Theory II (3)
 BPHD 8230 - Theory of Corporate Finance (3)
 BPHD 8240 - Derivatives (3)
 BPHD 8650 - Advanced Seminar in Finance (3)

Two of these courses, BPHD 8200 and BPHD 8240, are cross-listed with courses that are part of the Master of Science in Economics and the Master of Science in Mathematical Finance programs. Ph.D. students in these cross-listed courses will be required to complete the master's level requirements of the course and in addition, will be required to take separate exams, prepare a research paper, and complete additional readings. Students that have taken those equivalent courses may, at the discretion of the Graduate Program Director, substitute additional sections of BPHD 8650 on their Plan of Study for those courses. In addition, the Graduate Program Director may require a student to list BPHD 8650 more than once in their Plan of Study as topics change. Exceptions to the economics courses may only be made with the permission of the Ph.D. Program Director.

Research Support Courses (9 credit hours)

The Ph.D. in Business Administration requires that students have at least nine hours of research support courses in their Plan of Study. These research support courses must come from the Department of Mathematics and Statistics or Department of Economics. Students are required to choose three courses from the following:

ECON 6257 - Applied Computational Economics (3)
 MATH 6205 - Financial Computing (3)
 MATH 6206 - Stochastic Calculus for Finance II (3)
 MATH 8203 - Stochastic Calculus for Finance (3)
 MATH 8204 - Numerical Methods for Financial Derivatives (3)

Some of the research support courses are cross-listed with courses used in the M.S. in Mathematical Finance program. Students that have taken those equivalent courses may, at the discretion of the Graduate Program Director, take other mathematics, statistics, economics, finance or related courses in place of the courses specified above.

Elective Courses (12 credit hours)

In addition to the 60 credit hours of required coursework indicated above, students are required to complete 12 elective credit hours from the following:

- Additional course offering(s) with different topics of BPHD 8650 - Advanced Seminar in Finance (3)

- Additional Research Support Courses
- Additional Dissertation Credits

As an exception, students may, at the discretion of their Graduate Program Director, be permitted to use a course taken while enrolled in another graduate program to count toward the elective credit hours.

Dissertation Credits (18 credit hours)

Students are required to complete at least 18 hours of dissertation credits.

BPHD 8999 - Doctoral Dissertation Research

Degree Total = 72 Credit Hours

Grade Requirements

Students are expected to earn an A or B in all courses included in the program of study and must have at least a 3.0 GPA to graduate. The dissertation is graded on a Pass/Unsatisfactory basis and, therefore, is not be included in the cumulative average. An accumulation of more than two marginal (C) grades will result in suspension of the student's enrollment in the program. If students earn a grade of U in any course, their enrollment in the program is suspended, and the student cannot take further coursework without being readmitted to the program. Readmission to the program requires approval of the Dean of the Graduate School upon the recommendation of the Program Director.

Teaching Mentor and Pedagogy Training

To ensure that graduates of the program are prepared for a career in both teaching as well as in research, a formal system of pedagogical training is required. Students that enter the program without prior teaching experience will be assigned a faculty Teaching Mentor and will be required to attend a teaching workshop. Most students entering the program will also initially be employed as teaching assistants. Normally after one year in the program students will begin to teach their own sections of undergraduate courses. The combination of mentoring, apprenticeship training through the teaching assistantships, formal pedagogy, and actual instructor experience will allow students in the program to develop their teaching skills along with their research skills.

Diagnostic Evaluation

Students entering the program will take a diagnostic evaluation at the end of their first full year in the program. The diagnostic examination will be administered by the Program Director, in consultation with the Program Committee. The format of the diagnostic examination will be determined by the Committee, but might consist of a review of the student's work in classes, a written exam, or an oral exam. The purpose of the diagnostic evaluation

will be to determine whether the student is making sufficient progress toward the degree. Students that are determined not to be making satisfactory progress toward the degree will be suspended from the program.

Dissertation Advisor and Advisory Committee

Every student in the program must have a Dissertation Advisor and an Advisory Committee prior to being admitted to Candidacy. The student should select a dissertation advisor before the end of the second year of residency. The student and the dissertation advisor jointly determine the advisory committee. The Dissertation Advisor serves as Chair of the Advisory Committee and must be a member of the Graduate Faculty of UNC Charlotte. Normally, the Dissertation Advisor for a student will be a member of the Department of Finance. A student may petition the Program Director to allow a member of another department within the Belk College, or a member of the Department of Mathematics and Statistics, to serve as their Dissertation Advisor. The advisory committee must have at least four members, three of which are chosen by the student. Normally, two members will be from finance and one from economics. A student may petition the Program Director to allow a member of another department within the Belk College, or a member of the Department of Mathematics and Statistics to serve on the Committee. The fourth member of the committee will be the Graduate Faculty representative to the Committee. That member will be appointed by the Dean of the Graduate School. All members of the Committee must be members of the UNC Charlotte Graduate Faculty.

Qualifying Examination

Upon completion of all required finance coursework, a student must take the Qualifying Examination. The Qualifying Examination is typically taken at the end of the second summer in the program. This exam consists of the student presenting an original research paper on a topic in any area of finance. The paper must be sole-authored and presented in a seminar that includes the Examination Committee, which includes the Program Director and at least two other members of the Finance Department Faculty. The written paper must be provided to the Examination Committee at least three days prior to the seminar presentation. In addition to the Examination committee, the seminar may be attended by all faculty and doctoral students in the Belk College of Business. The paper and seminar presentation will be graded by the Examination Committee on a pass/fail basis. Students who fail the Qualifying Examination will be terminated from the program.

Admission to Candidacy

The dissertation topic may be proposed after the student has passed the Qualifying Examination. Pursuant to Graduate School rules, a doctoral student advances to

candidacy after the student's Advisory Committee and the Dean of the Graduate School approve the dissertation topic. Further pursuant to Graduate School rules, candidacy must be achieved at least six months before the degree is conferred.

Dissertation

The student must complete and defend a dissertation based on a research program approved by the student's Dissertation Advisor and Advisory Committee which results in a high-quality, original and substantial piece of research. The student must orally present and defend the dissertation before the Advisory Committee in a defense that is open to the University Community. A copy of the dissertation must be made available to the Graduate Faculty of the Belk College at least three weeks prior to the public defense. While the defense is open to the University Community, the deliberations of the Advisory Committee are held in Executive Session. The dissertation will be graded on a pass/unsatisfactory basis by the Advisory Committee and the Dean of the Graduate School.

The dissertation defense is the final examination. It is a Graduate School requirement that a student that fails the final examination twice will be terminated from the program.

Residency Requirement

The Ph.D. in Business Administration is a full-time program. Normally students must enroll for at least nine credit hours during each semester of the regular academic year (i.e., Fall and Spring) and at least six hours in the summer semester. Students may petition the Program Director for permission to enroll in less than nine credit hours (six credit hours in summer) in cases of hardship or other emergencies. Students that have passed their Qualifying Examinations must enroll in BPHD 8999 (Doctoral Dissertation Research) for at least 9 hours during the fall and spring semester and 6 hours during the summer semester. It is a Graduate School requirement that a student must enroll in at least 18 total hours of Dissertation Research in order to graduate from the program.

Students that have completed all degree requirements, including the Dissertation Defense, may enroll once in GRAD 9999 (Doctoral Degree Graduate Residency Credit) in order to meet Graduate School Residency requirements.

Assistantships

A number of graduate assistantships are available each year for qualified applicants. The Graduate School also has a limited number of fellowships available for highly qualified applicants.

Transfer Credit

Only courses with grades of A or B from an appropriate doctoral program at an AACSB accredited school may be accepted for transfer credit. Transfer credit must be approved by the Program Director, and cannot exceed the limit set by the Graduate School.

Time Limit for Degree Completion

The student must achieve candidacy for the Ph.D. degree within six years of enrolling in the program, and the student must complete all degree all requirements within nine years of enrolling in the program. All courses listed on the Plan of Study must also meet Graduate School time requirements.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Master of Business Administration (MBA)

Graduate Program

mba.charlotte.edu

The primary objective of graduate study in business is to develop candidates for leadership positions in complex organizations. The MBA program focuses on developing the expertise to lead, influence, and persuade others through effective written and spoken communications; the ability to approach complex problems both systematically and imaginatively; the confidence to make decisions in the face of imperfect information, competing objectives, and technological change; the insight to recognize the ethical dimensions of organizational and individual decisions; the sensitivity to recognize that organizational decisions involve teamwork and consensus-building across diverse groups of individuals; and the awareness that business represents an inherently multinational enterprise that exists without geographical or cultural boundaries.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Business Administration:

- A generally satisfactory undergraduate record from a college or university accredited by an accepted accredited body
- A satisfactory score on the Graduate Management Admission Test (GMAT) or Graduate Record Exam (GRE)

- A full resume or a description of significant work experience
- A satisfactory score on the TOEFL or IELTS examination for students whose native language is not English or that have not received a degree from a U.S. institution

GMAT/GRE Waiver

Option A (Standard Waiver)

Candidates must possess at least 3 years of professional or military experience with increasing levels of responsibility (significant leadership experience is a plus), a cumulative undergraduate or graduate (must have at least 9 hours of earned graduate credit) GPA of 3.0 or above from an accredited program and, if relevant, institution.

Option B (Quantitative Coursework Waiver)

Candidates must possess at least 3 years of professional or military experience with increasing levels of responsibility (significant leadership experience is a plus), or be able to demonstrate preparedness in quantitatively-oriented coursework (must have at least a 3.25 GPA in five of the following six courses: Microeconomics, Macroeconomics, Managerial Accounting, Financial Accounting, Statistics, and Calculus).

Candidates who meet the experience requirement, but do not have enough (or any) quantitative coursework to have their quantitative competencies assessed, must complete modules through MBAMath.com (or other approved online providers) with scores of 80% in each required module among the 5 areas (economics, finance, accounting, statistics and spreadsheets).

Degree Requirements

The MBA degree program consists of 36 graduate credit hours, including a Core component and a Concentration/Elective component. Up to 6 credit hours of coursework may be transferred from an AACSB-accredited institution or equivalent, based on a recommendation of the relevant academic department, approval of the Director of the MBA program, and approval of the Graduate School. Necessary preparatory work is determined during the admissions process, and prerequisite courses to meet the specific need are available. All students in the program must meet the Graduate School's requirements for a Master's Degree.

Required Core Courses (24 credit hours)

- MBAD 6101 - Ethical Leadership (0 to 3)
- MBAD 6112 - The Economics of Business Decisions (0 to 3)
- MBAD 6131 - Financial and Managerial Accounting for MBAs (0 to 3)
- MBAD 6141 - Operations Management (0 to 3)
- MBAD 6152 - Financial Management (0 to 3)
- MBAD 6161 - Human Behavior in Organizations (0 to 3)
- MBAD 6194 - Global Strategic Management (0 to 3)*

MBAD 6270 - Marketing Management (0 to 3)

**MBAD 6194 serves as the required capstone course for the MBA program. Thus, all core courses should be completed prior to taking MBAD 6194.*

Concentration Courses (12 credit hours)

Complete 12 credit hours of courses specified for a concentration. Students may enroll in these courses as soon as they complete the prerequisites for each course. MBAD 6890 and MBAD 7090 may be included in a concentration with permission of the MBA Program Director and the related department.

Business Analytics Concentration

Required Course(s)

MBAD 6201 - Business Intelligence and Analytics (0 to 3)
MBAD 6122 - Decision Modeling and Analysis (0 to 3)
MBAD 6211 - Advanced Business Analytics (0 to 3)

Elective Course(s)

Select one of the following:

MBAD 6202 - Digitization of Business Processes (0 to 3)
MBAD 6204 - Management of Cybersecurity and Privacy (0 to 3)
MBAD 6207 - Business Project Management (0 to 3)
MBAD 6208 - Supply Chain Management (0 to 3)
MBAD 6272 - Marketing Analysis and Decision-Making (0 to 3)
ECON 6112 - Graduate Econometrics (3)
ECON 6218 - Advanced Business and Economic Forecasting (3)

Digital Marketing

Required Course(s)

MBAD 6273 - Product and Brand Strategy in the Connected World (0 to 3)
MBAD 6277 - Social Media Marketing and Analytics (0 to 3)
MBAD 6284 - Digital Marketing Analytics (0 to 3)

Elective Course(s)

Select any one (1) course from the Business Analytics concentration

Energy Concentration

Required Course(s)

EMGT 5961 - Introduction to Energy Systems (3)
MBAD 6962 - Energy Markets (0 to 3)

Elective Course(s)

Select one of the following:

ECON 5181 - Energy and Environmental Economics (3)
EMGT 5963 - Energy Systems Planning (3)
EMGT 5964 - Case Studies in the Energy Industry (3)

And a different one from the following:

ECON 5181 - Energy and Environmental Economics (3)
EMGT 5963 - Energy Systems Planning (3)
EMGT 5964 - Case Studies in the Energy Industry (3)
EMGT 6901 - Advanced Project Management (3)
EMGT 6930 - Capital Cost Estimating (3)
FINN 6210 - Financial Elements of Derivatives (3)
MBAD 6157 - Advanced Corporate Finance (0 to 3)

Entrepreneurship and Corporate Venturing

Required Course(s)

MBAD 3300 - Entrepreneurial Decisions (3)

Elective Course(s)

Select three of the following:

MBAD 6191 - Entrepreneurial Strategy (0 to 3)
MBAD 6279 - Design Thinking and Innovation (0 to 3)
MBAD 6302 - Evaluating Entrepreneurial Opportunities (0 to 3)
MBAD 6304 - Entrepreneurial Organizing (0 to 3)
MBAD 6305 - Entrepreneurship and Uncertainty (0 to 3)
MBAD 6306 - Corporate Entrepreneurship (0 to 3)
MBAD 6309 - Business Models and Business Plans (0 to 3)

Finance

Required Course(s)

MBAD 6153 - Investment Management (0 to 3)
MBAD 6157 - Advanced Corporate Finance (0 to 3)

Elective Course(s)

Select two of the following:

FINN 5161 - Financial Modeling (3)
FINN 6210 - Financial Elements of Derivatives (3)
FINN 6211 - Fixed Income Securities and Credit Risk (3)
MBAD 5158 - Student Managed Investment Fund I (0 to 3)
MBAD 5159 - Student Managed Investment Fund II (0 to 3)
MBAD 6150 - Foundations of FinTech (3)
MBAD 6151 - Financial Institutions and Markets (0 to 3)
MBAD 6155 - Multinational Financial Management (0 to 3)
MBAD 6154 - Applied Business Finance (0 to 3)
MBAD 6156 - Commercial Bank Management (0 to 3)

MBAD 5158 and MBAD 5159 must be taken in sequence within the same academic year.

Financial Analytics and Modeling

Required Course(s):

FINN 5161 - Financial Modeling (3)
MBAD 6150 - Foundations of FinTech (3)
MBAD 6154 - Applied Business Finance (0 to 3)

Elective Course(s):

Select one of the following:

MBAD 6122 - Decision Modeling and Analysis (0 to 3)
MBAD 6201 - Business Intelligence and Analytics (0 to 3)
MBAD 6211 - Advanced Business Analytics (0 to 3)

Global Business Concentration

Required Course(s)

MBAD 6193 - Global Business Environment (0 to 3)
 MBAD 6197 - International Business Management (0 to 3)
 Plus one course involving MBA-approved international study or travel (3)

Elective Course(s)

Select one of the following:

MBAD 6275 - Global Marketing Strategy (0 to 3)
 MBAD 6155 - Multinational Financial Management (0 to 3)

Information and Technology Management Concentration*Required Course(s)*

Select two (or three) of the following:

MBAD 6202 - Digitization of Business Processes (0 to 3)
 MBAD 6204 - Management of Cybersecurity and Privacy (0 to 3)
 MBAD 6207 - Business Project Management (0 to 3)

Elective Course(s)

Select two (or one if three required courses are selected) of the following:

MBAD 6122 - Decision Modeling and Analysis (0 to 3)
 MBAD 6201 - Business Intelligence and Analytics (0 to 3)
 MBAD 6208 - Supply Chain Management (0 to 3)

Innovation and Growth Strategies Concentration*Elective Course(s)*

Select three of the following:

MBAD 6271 - Consumer Behavior and Strategy (0 to 3)
 MBAD 6273 - Product and Brand Strategy in the Connected World (0 to 3)
 MBAD 6279 - Design Thinking and Innovation (0 to 3)

Plus one of the following:

MBAD 6272 - Marketing Analysis and Decision-Making (0 to 3)
 MBAD 6277 - Social Media Marketing and Analytics (0 to 3)
 MBAD 6309 - Business Models and Business Plans (0 to 3)

Note: MBAD 6890 (Directed Individual Study) and MBAD 7090 (Special Topics in Business) may be included in the concentration with permission of both the MBA Program Director and Department Chair.

Management Concentration*Elective Course(s)*

Select four of the following:

MBAD 6163 - Managing People for Competitive Advantage (0 to 3)
 MBAD 6164 - Executive Communication (0 to 3)
 MBAD 6165 - Negotiation and Conflict Management (0 to 3)
 MBAD 6191 - Entrepreneurial Strategy (0 to 3)
 MBAD 6192 - Business Ethics and Corporate Responsibility (0 to 3)

MBAD 6193 - Global Business Environment (0 to 3)

MBAD 6197 - International Business Management (0 to 3)

MBAD 6207 - Business Project Management (0 to 3)

Marketing Concentration*Elective Course(s)*

Select four of the following:

MBAD 6271 - Consumer Behavior and Strategy (0 to 3)
 MBAD 6272 - Marketing Analysis and Decision-Making (0 to 3)
 MBAD 6273 - Product and Brand Strategy in the Connected World (0 to 3)
 MBAD 6274 - Advertising and Promotion Strategy (0 to 3)
 MBAD 6275 - Global Marketing Strategy (0 to 3)
 MBAD 6276 - Strategic Business Analytics (0 to 3)
 MBAD 6277 - Social Media Marketing and Analytics (0 to 3)
 MBAD 6279 - Design Thinking and Innovation (0 to 3)
 MBAD 6282 - Marketing of Sports (0 to 3)

Real Estate Finance and Development Concentration*Required Course(s)*

MBAD 6158 - Real Estate Finance and Investment (0 to 3)
 MBAD 6159 - Real Estate Development (0 to 3)

Elective Course(s)

Select two of the following:

MBAD 6160 - Real Estate Capital Markets (0 to 3)
 MBAD 6258 - Site Feasibility Analysis (0 to 3)
 MBAD 6259 - Applied Real Estate Development (0 to 3)
 ECON 6250 - Advanced Urban and Regional Economics (3)
 MSRE 6102 - International Real Estate Study Tour (3)
 MSRE 6120 - Real Estate Law (1.5)
 MSRE 6130 - Site Planning (1.5)
 MSRE 6220 - Financial Analysis of Real Estate Investments (1.5)
 MSRE 6230 - Construction Management (1.5)

Supply Chain Management Concentration*Required Course(s)*

MBAD 6122 - Decision Modeling and Analysis (0 to 3)
 MBAD 6208 - Supply Chain Management (0 to 3)

Elective Course(s)

Select two of the following:

MBAD 6201 - Business Intelligence and Analytics (0 to 3)
 MBAD 6207 - Business Project Management (0 to 3)
 ECON 6112 - Graduate Econometrics (3)

Student Structured Concentration

Students may propose a 12 credit hour concentration in a significant area of interest for approval by the Director of the MBA program. This concentration may include graduate courses from other programs within the University with approval of the MBA Program Director and the related department.

Degree Total = 36 Credit Hours

Dual Master's Degree Program

MBA candidates interested in combining their business degree with another graduate degree may pursue this option by applying to and being accepted by each program separately. Students must formally propose their dual degree intentions with the Graduate School. A significant time savings may be yielded as a result of the synergy between combined programs. Popular dual degree options for MBA candidates include the Master of Health Administration, Master of Public Administration, Master of Accountancy, Master of Urban Design, and Master of Architecture.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Assistantships

A limited number of assistantships are available each year. In order to be competitive, applications should be submitted by March 15. Additional information is available in the MBA office and the Graduate School website.

Advising

Academic Advising is provided by Associate Director of Graduate Student Services and the Director of the MBA Program.

Transfer Credit

Up to six hours of appropriate graduate credit may be accepted for transfer from another AACSB-accredited (or equivalent) MBA program. Only courses where grades of B or above have been earned will be considered. Approval of the Director of the MBA Program and the Graduate School is also required. All other Graduate School policies regarding transfer credit apply.

Program Certifications/Accreditation

The MBA Program and all degree and certificate programs offered by the Belk College of Business are accredited by the Association to Advance Collegiate Schools of Business (AACSB-International).

Master of Business Administration (MBA) / Master of Health Administration (MHA) Dual Degree

This dual degree program allows students to earn both a Master of Business Administration (MBA) degree from the Belk College of Business and a Master of Health Administration (MHA) degree from the College of Health and Human Services.

Applicants might be offered admission into only the MHA or MBA instead of the dual program. Similarly, students admitted into the dual program may opt to matriculate into only the MHA or MBA program. Students who have matriculated into either the MHA or MBA program who desire to add the dual degree must apply and gain admission to the dual degree no later than the end of their first semester of matriculation into either program.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Health Administration, MHA and Business Administration, M.B.A. sections of this catalog for individual program admissions requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Health Administration, MHA and Business Administration, MBA) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Health Administration, MHA

The Health Administration, MHA program allows 12 credits to be shared from Business Administration, M.B.A. as follows:

Degree Requirement(s)	MBA Course(s) Allowed	Credits
HADM 6116 – Accounting for Healthcare Management	MBAD 6131 – Management Accounting	3
HADM 6124 – Marketing in Healthcare	MBAD 6270 – Marketing Management	3
Elective	Any MBA concentration course	3

Elective	Any MBA concentration course	3

Business Administration, M.B.A.

The Business Administration, MBA program allows 9 to be shared from Health Administration, MHA as follows:

Degree Requirement(s)	MHA Course(s) Allowed	Credits
MBAD 6101 – Ethical Leadership	HADM 6150 – Health Law and Ethics	3
MBAD 6161 – Human Behavior in Organizations	HADM 6145 – Organization Behavior in Healthcare	3
Concentration elective	HADM 6104 – Population Health & Disease	3

Dual Degree Total = 66 Credit Hours

MBA PLUS Post-Master's Certificate

The MBA PLUS Post-Master's Certificate program provides an opportunity for graduates of AACSB-accredited MBA programs to broaden and update their business education. As business conditions, tools, and techniques change rapidly, a major way of staying at the forefront of knowledge is through additional university education. The MBA PLUS Certificate makes courses in the Belk College's MBA Concentrations available to persons who already have MBA degrees.

Admission Requirements

Applicants must satisfy the general requirements established by the Graduate School for admission to a graduate certificate program. Applicants must provide one official transcript indicating the awarding of an MBA degree from an AACSB-accredited institution or equivalent, one official transcript indicating the awarding of an accredited bachelor's degree, along with the Graduate application and application fee. (Graduates from the MBA program at UNC Charlotte are not required to send an official transcript.) Applicants will not be required to retake the GMAT.

Certificate Requirements

The MBA PLUS Certificate requires completion of 12 or more credit hours of 6000-level courses. At least 9 credit hours must be elective courses. One 3-credit hour course may be a repeat of a course previously taken. A student may repeat more courses, but only one such repeated course will be counted toward the certificate. The 12-credit hour elective course requirement of the MBA PLUS

corresponds to the 12-credit hour concentrations in the MBA program.

It is expected that most students will use their 12 credit hours or more to gain a concentration in a particular functional area of interest. However, a broader program that draws from a number of areas may be pursued.

Transfer credits are not accepted in the MBA PLUS Certificate program.

Certificate Total = 12 Credit Hours

Grade Requirements

To receive the certificate, students must complete all courses with a grade of B or above within five years from the time of enrollment in the first certificate course.

Graduate Certificate in Business Analytics

The Graduate Certificate in Business Analytics provides students with a foundation in business analytics. The aim of the certificate is to satisfy the large and rapidly increasing demand in the marketplace for data-driven decision making in business. Students learn how to understand and apply data analytics techniques in business decisions. Demand for these skills has been driven predominantly by exponential growth in the generation of unstructured data by consumers -- often referred to as the "Big Data Revolution." Students considering graduate study in business analytics learn how to turn abstract data into important information that can be used in business decisions.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Business Analytics:

- A bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body
- GPA of at least 2.75 (based on a 4.0 scale) on all previous coursework completed beyond high school (secondary school)
- An online application through the Graduate School's application system
- A statement of purpose
- Unofficial transcripts of all attempted college coursework
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is

not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution

Certificate Requirements

The Graduate Certificate in Business Analytics requires the completion of 12 credit hours of 6000-level courses in business and marketing analytics. Transfer credits are not accepted into the Graduate Certificate in Business Analytics program.

Core Courses (6 credit hours)

MBAD 6201 - Business Intelligence and Analytics (0 to 3)

MBAD 6276 - Strategic Business Analytics (0 to 3)

Elective Courses (6 credit hours)

Select two of the following:

MBAD 6122 - Decision Modeling and Analysis (0 to 3)

MBAD 6207 - Business Project Management (0 to 3)

MBAD 6211 - Advanced Business Analytics (0 to 3)

MBAD 6212 - Enterprise Systems (3)

MBAD 6213 - Applied Healthcare Business Analytics (3)

MBAD 6272 - Marketing Analysis and Decision-Making (0 to 3)

MBAD 6277 - Social Media Marketing and Analytics (0 to 3)

MBAD 6283 - Mobile Marketing and Analytics (0 to 3)

MBAD 7090 - Special Topics in Business (0 to 4) (*Big Data Analytics for Competitive Advantage*)

Certificate Total = 12 Credit Hours

Grade Requirements

Students must earn a grade of B or above in all four courses that make up the certificate program.

Graduate Certificate in Corporate Venturing

The Graduate Certificate in Corporate Venturing provides students with a strong foundation in entrepreneurship within existing corporations. The certificate aims to satisfy the increasing societal demand for skill sets related to leading innovative and transformative projects within existing corporations.

Additionally, the Graduate Certificate in Corporate Venturing allows students considering graduate study in the Master of Business Administration (MBA) program to explore material prior to formally committing to a full graduate degree program. All certificate courses can then be transferred into the MBA program at UNC Charlotte. However, admission to the MBA program requires a separate application and satisfaction of MBA program

admission requirements.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Corporate Venturing:

- A bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body
- GPA of at least 2.75 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school)
- An online application through the Graduate School's application system
- A statement of purpose
- Unofficial transcripts of all college course work attempted
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution

Certificate Requirements

The Graduate Certificate in Corporate Venturing requires completion of 12 credit hours (4 courses) of 6000-level courses in entrepreneurship and innovation. Transfer credit is not accepted into the Graduate Certificate in Corporate Venturing program.

Core Courses (6 credit hours)

MBAD 6306 - Corporate Entrepreneurship (0 to 3)

MBAD 6309 - Business Models and Business Plans (0 to 3)

Elective Courses (6 credit hours)

Select two of the following:

MBAD 5300 - Entrepreneurial Decisions (0 to 3)

MBAD 6191 - Entrepreneurial Strategy (0 to 3)

MBAD 6207 - Business Project Management (0 to 3)

MBAD 6273 - Product and Brand Strategy in the Connected World (0 to 3)

MBAD 6279 - Design Thinking and Innovation (0 to 3)

MBAD 6302 - Evaluating Entrepreneurial Opportunities (0 to 3)

MBAD 6304 - Entrepreneurial Organizing (0 to 3)

MBAD 6305 - Entrepreneurship and Uncertainty (0 to 3)

Certificate Total = 12 Credit Hours

Grade Requirements

Students must earn a grade of B or above in all four courses that make up the certification program.

ECONOMICS

- **M.S. in Economics**
 - Applied Economic Analysis
 - Financial Management
 - Quantitative Financial Economics
 - Quantitative Methods in Economics
 - Urban Economics and Real Estate
- **M.S. in Economics/M.Sc. in Economics Dual Degree**
- **M.S. in Economics/M.S. in Mathematical Finance Dual Degree**
(see the *Mathematical Finance* section)
- **Graduate Certificate in Applied Econometrics**

Department of Economics

belkcollege.charlotte.edu/departments/economics

Graduate Program

msecon.charlotte.edu

M.S. in Economics

The Master of Science (M.S.) in Economics degree program features a curriculum that is flexible yet thorough in its approach to theoretical training and applied coursework. The program offers four concentrations in: (1) Quantitative Methods in Economics, (2) Quantitative Financial Economics, (3) Financial Management, and (4) Applied Economic Analysis. Students completing this program are prepared for analytical and management positions that require the integration of economic analysis and advanced quantitative methods. Employment opportunities for economists with a master's degree exist in both the public and private sectors. In addition, students with a master's degree may choose to pursue additional graduate education leading to a doctoral degree in Economics, Finance, or Public Policy.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Economics:

- Undergraduate coursework that includes: Calculus, Econometrics (or equivalent), Intermediate Macroeconomic Theory, Intermediate Microeconomic Theory, and Mathematical Economics (preferred) (*Students missing some of these courses*

can still be admitted with permission of Graduate Program Director)

- A satisfactory score on the aptitude portions of the Graduate Record Examination (GRE) (*The Graduate Management Aptitude Test (GMAT) may be substituted for the GRE with permission of the Graduate Program Director*)

GRE Waiver

The GMAT/GRE requirement may be waived for applicants who meet the following criteria:

- **General Applicants** – 3.0 or above undergraduate GPA, with grades of A or B in Economics, Math, and Statistics courses, or more than one year of relevant work experience
- **Early Entry Applicants** – 3.2 or above undergraduate GPA, with grades of A or B in Economics, Math, and Statistics courses
- **Graduate Certificate in Applied Econometrics Students** – completion of a minimum of two courses with grades of B or above, and a graduate GPA of 3.0 or higher

The waiver must be requested from the M.S. in Economics Graduate Program Director when submitting the completed application. All GMAT/GRE waivers are at the discretion of the M.S. in Economics Graduate Program Director. If candidates are unable to secure the GMAT/GRE waiver, they will be required to submit official GMAT/GRE test scores in their M.S. Economics application.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Accelerated Master's Program

Academically talented high school seniors and UNC Charlotte undergraduate freshmen are encouraged to apply for the Accelerated Master's Program to begin work toward both undergraduate and graduate degrees in their Freshman year. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Accelerated Master's Programs.

Degree Requirements

The program leading to the Master of Science degree in Economics requires at least 30 hours of graduate credit,

with a maximum of six hours of transfer credit accepted from an accredited institution. (Credit applied toward an awarded graduate degree will not be accepted as transfer credit.) Courses taken at other accredited institutions after enrollment may receive residence credit if approved by the department and the Dean of the Graduate School. No more than two grades of C are permitted in the program and at least 18 credit hours must be completed before admission to candidacy. A GPA of at least 3.0 is required to graduate. The program is organized into three curriculum components:

- 1) Core Curriculum in economic theory and quantitative methods
- 2) Research Project or Thesis
- 3) Concentration selected from one of the four described below

Core Courses (12 credit hours)

ECON 6201 - Advanced Macroeconomic Theory (3)
 ECON 6202 - Advanced Microeconomic Theory (3)
 ECON 6112 - Graduate Econometrics (3)
 ECON 6218 - Advanced Business and Economic Forecasting (3)

Concentrations

Quantitative Methods in Economics Concentration

The Concentration in Quantitative Methods in Economics is designed for students who want to study quantitative methods in detail. It is an ideal option for those students interested in applying quantitative modeling and methods for economic analysis in their chosen field or pursuing an Economics Ph.D. after completion of the M.S. in Economics program. This concentration can be completed in one and a half years of study.

Students in this concentration must complete the core curriculum and the research project or thesis for the M.S. in Economics. In addition, they must complete:

ECON 6217 - Advanced Microeconometrics
 ECON 6219 - Financial Econometrics

And two of the following:

ECON 5161 - Game Theory and Experiments
 ECON 6203 - Financial Economic Theory
 ECON 6235 - Monetary and Financial Theory
 ECON 6257 - Applied Computational Economics

OR a combination of the above courses and approved elective courses that total 6 credit hours

Quantitative Financial Economics Concentration

The Concentration in Quantitative Financial Economics is designed for students interested in pursuing careers in portfolio management or financial risk management. This concentration can also provide an excellent foundation

for students who wish to pursue additional graduate study leading to a doctoral degree in Finance. The concentration can be completed in one and a half years of study.

Students in this concentration must complete the core curriculum and the research project or thesis for the M.S. in Economics. In addition, they must complete:

ECON 6203 - Financial Economic Theory (3)
 ECON 6219 - Financial Econometrics (3)
 FINN 6210 - Financial Elements of Derivatives (3)

And one of the following:

FINN 6211 - Fixed Income Securities and Credit Risk (3)
 ECON 6235 - Monetary and Financial Theory (3)
 An approved elective course

Urban Economics and Real Estate Concentration

The Concentration in Real Estate and Urban Economics is designed for students who want to study real estate finance and urban economics in detail. It is an ideal option for those students interested in applying economic analysis to the area of real estate finance or pursuing an Economics or Real Estate Ph.D. after completion of the M.S. in Economics program. This concentration can be completed in one and a half years of study.

Students in this concentration must complete the core curriculum and the research project or thesis for the M. S. in Economics. In addition, they must complete:

MSRE 6158 - Real Estate Finance and Investment (3)
 MSRE 6160 - Real Estate Capital Markets (3)
 MSRE 6238 - Real Estate and Urban Economics (3)

And one of the following:

MSRE 6102 - International Real Estate Study Tour (3)
 MSRE 6220 - Financial Analysis of Real Estate Investments (3)

Financial Management Concentration

The Concentration in Financial Management is designed for students interested in pursuing careers in corporate finance or financial planning. This concentration can be completed in one full year of study if the student chooses the thesis option.

Students in this concentration must complete the core curriculum and the research project or thesis for the M.S. in Economics. In addition, they must complete:

FINN 6152 - Financial Management (3)
 FINN 6153 - Investment Management (3)
 FINN 6157 - Advanced Corporate Finance (3)

And one of the following:

FINN 6155 - Multinational Financial Management (3)

ECON 6235 - Monetary and Financial Theory (3)

An approved elective course

Applied Economic Analysis Concentration

The Concentration in Applied Economic Analysis is designed for students who wish to pursue a specialized course of study. This concentration can be completed in one full year of study if the student chooses the thesis option.

Students in this concentration must complete the core curriculum and the research project or thesis for the M.S. in Economics. In addition, they must complete 12 credit hours of elective courses chosen from among 5000 level and higher ECON courses, 6000 level and higher FINN courses, or courses approved by the program director.

Research Project or Thesis

Research Project/Non-Thesis Option

Students enrolled in the non-thesis option must complete the following research courses:

ECON 6901 Research Methods for Economists I (3)

ECON 6902 Research Methods for Economists II (3)

Thesis Option

Students who choose the thesis track must successfully complete six credit hours of ECON 6999. The thesis must be written and defended within six calendar years after admission into the M.S. in Economics program. The Thesis Committee, which must be approved by the Graduate Program Director, will consist of a Chair and at least two other faculty members. ECON 6999 is graded on an A, B, C, or U basis.

ECON 6999 Graduate Thesis Research (3)

Degree Total = 30 Credit Hours

Grade Requirements

No more than two grades of C are permitted in the program and at least 18 credit hours must be completed before admission to candidacy. A minimum GPA of 3.0 is required to graduate.

Advising

Prior to, or concurrent with, the first semester of study, each student will be expected to complete a program of study listing each class the student expects to take as a part of the program. The program of study requires the approval of the coordinator.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Program Certifications/Accreditations

The Belk College of Business is accredited by the Association to Advance Collegiate Schools of Business (AACSB).

M.S. in Economics/M.Sc. in Economics Dual Degree

The Belk College of Business, in partnership with the Universität Regensburg (<https://www.uni-regensburg.de/>) in Regensburg, Germany, offers a dual degree program. Students in this program may earn the M.S. in Economics from UNC Charlotte and a M.Sc. in Economics from University of Regensburg. Visit Belk College Global Partners (<https://belkcollege.charlotte.edu/about-us/global-partners/>) for additional information.

Admission Requirements

Students must meet the admissions criteria for both the M.S. Economics at UNC Charlotte and the M.Sc. Economics at Universität Regensburg.

See Belk College of Business Global Partners for details.

Degree Requirements

This is a 36 credit hour program in which students earn 18 credit hours at UNC Charlotte and spend one year at Universität Regensburg to earn the additional 18 credit hours, of which 15 are transferred back to meet the required 30 credit hour minimum for UNC Charlotte's M.S. in Economics.

Curriculum Plan

Students spend their first academic year at UNC Charlotte and take the following M.S. Economics Core:

ECON 6112 - Graduate Econometrics (3)

ECON 6201 - Advanced Macroeconomic Theory (3)

ECON 6202 - Advanced Microeconomic Theory (3)

ECON 6218 - Advanced Business and Economic Forecasting (3)

Concentration

Students select one of the following Concentrations and take two courses at UNC Charlotte during their first academic year, and the remaining at Universität Regensburg.

Quantitative Methods in Economics Concentration

ECON 6217 - Advanced Microeconometrics (3)

ECON 6219 - Financial Econometrics (3)

or FINN 6219 - Financial Econometrics (3)

Select any three courses at Universität Regensburg:

- Applied Financial Economics
- Advanced Monetary Economics
- Computational Economics and Finance
- Topics in Macroeconomics and Housing Markets
- Impact Evaluation Methods

Quantitative Financial Economics Concentration

FINN 6203 - Financial Economic Theory (3)

FINN 6210 - Financial Elements of Derivatives (3)

Select any three courses at Universität Regensburg:

- Applied Financial Econometrics
- Advanced Monetary Economics
- Computational Economics and Finance
- Topics in Macroeconomics and Housing Markets
- Impact Evaluation Methods

Applied Economic Analysis Concentration

At UNC Charlotte, two approved 5000 level or higher ECON courses, 6000 level or higher FINN courses, or courses approved by the program director. At Universität Regensburg, three approved graduate level electives from the M.Sc.

Seminar

All students are required to take the Universität Regensburg Seminar.

Research Project or Thesis

Students will enroll in thesis hours at Universität Regensburg, which will satisfy UNC Charlotte's M.S. Economics research requirement.

- Thesis hours or Research Method I
- Thesis hours or Research Method II

Degree Total = 36 Credit Hours**Program Certifications/Accreditations**

The College of Business is accredited by the Association to Advance Collegiate Schools of Business (AACSB).

Graduate Certificate in Applied Econometrics

The Graduate Certificate in Applied Econometrics provides students with a strong foundation in applied econometrics,

a skill set that is increasingly in demand. Additionally, students considering graduate study in economics have the opportunity to explore material prior to formally committing to a full graduate degree program.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Economics:

- A bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body
- GPA of at least 2.75 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school)
- An online application through the Graduate School's application system
- A statement of purpose
- Unofficial transcripts of all college course work attempted
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution

Certificate Requirements

The Graduate Certificate in Applied Econometrics requires completion of 12 credit hours of 6000-level courses in econometrics. Transfer credits are not accepted into the Graduate Certificate in Applied Econometrics program.

Core Courses (9 credit hours)

ECON 6112 - Graduate Econometrics (3)

ECON 6217 - Advanced Microeconometrics (3)

ECON 6218 - Advanced Business and Economic Forecasting (3)

Elective Course (3 credit hours)

Select one of the following:

ECON 6219 - Financial Econometrics (3)

ECON 6257 - Applied Computational Economics (3)

Certificate Total = 12 Credit Hours**Grade Requirements**

Students must earn a grade of B or above in all four courses that make up the certificate program.

GLOBAL BUSINESS

- Master of Business Administration (MBA) with Concentration in Global Business *(See the Business Administration section)*
- MBA in Global Business and Strategy Dual Degree, Graduate Certificate in Global Business and Strategy (Mexico)
- M.S. in Mathematical Finance/Laurea Magistrale (LM) in Banking and Finance Dual Degree (Italy)
- M.S. in Mathematical Finance/Master's in Finance Dual Degree (CUFE, China)
- M.S. in Mathematical Finance/Master's in Finance Dual Degree (SUFU, China)
- M.S. in Mathematical Finance/Master's in Quantitative Finance (Taiwan)

Global Business Programs
globalbusiness.charlotte.edu

Dual MBA with specialization in Global Business and Strategy, Graduate Certificate in Global Business and Strategy

The Belk College of Business at UNC Charlotte, in partnership with the Graduate School of Business Administration and Leadership (EGADE) at Tecnológico de Monterrey in Monterrey, Mexico, offers a dual degree Master's program. Students earn two MBA degrees: one from UNC Charlotte and one from Tecnológico de Monterrey. Students also receive a Graduate Certificate in Global Business and Strategy jointly issued from EGADE and the Belk College of Business. The program is taught in English in Monterrey, Mexico. Students in the program have the option of taking one semester at the Belk College of Business in Charlotte, NC. Visit <https://belkcollege.charlotte.edu/about-us/global-partners/> for additional information.

Admission Requirements

See Belk College of Business Global Partners for additional information (<https://belkcollege.charlotte.edu/about-us/global-partners/>).

Degree Requirements

To complete the UNC Charlotte MBA degree, students must complete a total of 36 credit hours (24 credit hours must be taken from the Belk College of Business faculty). The required 36 credit hours does not include preparatory classes.

Required Courses

MBAD 6101 - Ethical Leadership (0 to 3)
 MBAD 6112 - The Economics of Business Decisions (0 to 3)
 MBAD 6131 - Financial and Managerial Accounting for MBAs (0 to 3)
 MBAD 6141 - Operations Management (0 to 3)
 MBAD 6152 - Financial Management (0 to 3)
 M
 MBAD 6194 - Global Strategic Management (0 to 3)
 MBAD 6270 - Marketing Management (0 to 3)

Elective Courses

The advisors at EGADE help students select the elective courses that satisfy the dual degree requirements.

Degree Total = 36 Credit Hours

M.S. in Mathematical Finance/Laurea Magistrale (LM) in Banking and Finance Dual Degree

The Belk College of Business, in partnership with Università Cattolica del Sacro Cuore (UCSC) in Milan, Italy, offers a dual degree program. Students in this program may earn the M.S. in Mathematical Finance with a Concentration in Risk Management from UNC Charlotte and a Laurea Magistrale (LM) in Banking and Finance from UCSC. Visit Belk College of Business Global Partners for additional information (<https://belkcollege.charlotte.edu/about-us/global-partners/>).

Admission Requirements

Visit Belk College of Business International Dual Degrees for additional information (<https://mathfinance.charlotte.edu/international-dual-degrees/>).

Degree Requirements

This is a 48 credit hour program in which students earn 24

credit hours at UNC Charlotte and spend one year at UCSC to earn the additional 24 credit hours. In addition to these courses, students are also required to pass the comprehensive exam through UNC Charlotte as well as complete a thesis through UCSC.

UNC Charlotte Courses

Students spend their first academic year at UNC Charlotte and take the following:

FINN 6203 - Financial Economic Theory (3)
 FINN 6211 - Fixed Income Securities and Credit Risk (3)
 FINN 6214 - Asset and Portfolio Management (3)
 FINN 6215 - Risk Management in Insurance Companies (3)
 FINN 6216 - Quantitative Risk Management (3)
 FINN 6219 - Financial Econometrics (3)
 or ECON 6219 - Financial Econometrics (3)
 ECON 6113 - Cross-Section and Time-Series Econometrics (3)
 or STAT 6113 - Cross-Section and Time-Series Econometrics (3)
 MATH 6203 - Stochastic Calculus for Finance I (3)

UCSC Courses

In the second year at UCSC, students take the following courses:

- Advanced Financial Accounting
- Quantitative Methods for Finance
- Corporate Finance
- Monetary Economics
- Principles of Financial Regulation
- Derivatives Securities Pricing
- Risk Management
- Foreign Language*
- Theology**

**Part of the requirement for the degree is to take a practical Italian language course to learn essential day-to-day words and phrases.*

***Part of Italian learning is to take a theology course. This is an appreciation/culture course.*

Additional Requirements

In addition to these courses, students are also required to pass the comprehensive exam through UNC Charlotte as well as complete a thesis through UCSC.

Degree Total = 48 Credit Hours

M.S. in Mathematical Finance/ Master's in Finance Dual Degree (CUFE)

The Belk College of Business, in partnership with the Central University of Finance and Economics (CUFE), China, offers a dual degree program. Students in this program earn the M.S. in Mathematical Finance from UNC Charlotte and a Master's in Finance from CUFE. Students study for one year at UNC Charlotte and two years at CUFE.

Students gain strong quantitative skills in mathematics and in-depth knowledge of financial instruments and markets, and gain a solid understanding of finance, monetary economics, and banking regulation. Visit Belk College of Business Global Partners for additional information (<https://belkcollege.charlotte.edu/about-us/global-partners/>).

Admission Requirements

Students must meet the normal graduate admission requirements for both CUFE and UNC Charlotte. Visit <https://belkcollege.charlotte.edu/about-us/global-partners/> for details.

Degree Requirements

UNC Charlotte Courses

Students enroll in the Financial Data Analytics Concentration or the Quantitative Finance Concentration. Students take the following courses at UNC Charlotte:

ECON 6113 - Cross-Section and Time-Series Econometrics (3)
 or STAT 6113 - Cross-Section and Time-Series Econometrics (3)
 ECON 6219 - Financial Econometrics (3)
 or FINN 6219 - Financial Econometrics (3)
 FINN 6210 - Financial Elements of Derivatives (3)
 FINN 6211 - Fixed Income Securities and Credit Risk (3)
 ITCS 6114 - Algorithms and Data Structures (3)
 MATH 6203 - Stochastic Calculus for Finance I (3)
 MATH 6204 - Computational Methods for Asset Pricing (3)
 STAT 6115 - Statistical Learning with Big Data (3)

CUFE Courses

The following courses offered by the program at CUFE can be used to replace corresponding courses offered by the program at UNC Charlotte, and will transfer to UNC Charlotte as a total of 6 credit hours:

- Financial Theory and Policy, 3 credit hours
- Financial Institutions and Markets, 2 credit hours

- Investment, 2 credit hours

Credit for the above mentioned courses can be transferred to UNC Charlotte if an equivalent grade of B or better is earned.

Capstone Requirement

In addition to these courses, students are also required to pass the comprehensive exam through UNC Charlotte.

Degree Total = 30 Credit Hours

M.S. in Mathematical Finance/ Master's in Finance Dual Degree (SUFU)

The Belk College of Business, in partnership with the Shanghai University of Finance and Economics (SUFU), China, offers a dual degree program. Students in this program earn the M.S. in Mathematical Finance from UNC Charlotte and a Master's in Finance from SUFU. Students study for one year at UNC Charlotte and two years at SUFU.

Students gain strong quantitative skills in mathematics and in-depth knowledge of financial instruments and markets, and gain a solid understanding of finance, monetary economics, and banking regulation. Visit Belk College of Business Global Partners for additional information (<https://belkcollege.charlotte.edu/about-us/global-partners/>).

Admission Requirements

Visit Belk College of Business International Dual Degrees for additional information (<https://mathfinance.charlotte.edu/international-dual-degrees/>).

Degree Requirements

UNC Charlotte Courses

Students take the following courses at UNC Charlotte:

ECON 6113 - Cross-Section and Time-Series Econometrics (3) or STAT 6113 - Cross-Section and Time-Series Econometrics (3)
FINN 6203 - Financial Economic Theory (3)
FINN 6211 - Fixed Income Securities and Credit Risk (3)
FINN 6212 - Advanced Methods in Mathematical Finance (3)
MATH 6203 - Stochastic Calculus for Finance I (3)
MATH 6204 - Numerical Methods for Financial Derivatives (3)

SUFU Courses

The following courses offered by the program at SUFU can be used to replace corresponding courses offered by the program at UNC Charlotte:

- Analysis of Financial Derivative
- Financial Econometrics

Credit for the above mentioned courses can be transferred to UNC Charlotte if an equivalent grade of B or better is earned.

Capstone Requirement

In addition to these courses, students are also required to pass the comprehensive exam through UNC Charlotte.

Degree Total = 30 Credit Hours

M.S. in Mathematical Finance/ Master's in Quantitative Finance Dual Degree

The Belk College of Business, in partnership with the National Tsing Hua University (NTHU), Taiwan, offers a dual degree program. Students in this program earn the M.S. in Mathematical Finance from UNC Charlotte and a Master's in Quantitative Finance from NTHU. Students study for one year at UNC Charlotte and two years at NTHU.

Students gain strong quantitative skills in mathematics and in-depth knowledge of financial instruments and markets, and gain a solid understanding of finance, monetary economics, and banking regulation.

Visit globalbusiness.charlotte.edu for additional information.

Admission Requirements

Students must meet the normal graduate admission requirements for both NTHU and UNC Charlotte.

Visit globalbusiness.charlotte.edu for details.

Degree Requirements

UNC Charlotte Courses

Students enroll in the FinTech and Quantitative Finance Concentration, and take the following courses at UNC Charlotte:

Students enroll in the FinTech and Quantitative Finance Concentration, and take the following courses at UNC Charlotte:

ECON 6113 - Cross-Section and Time-Series Econometrics (3)
 or STAT 6113 - Cross-Section and Time-Series Econometrics (3)
 FINN 6210 - Financial Elements of Derivatives (3)
 FINN 6212 - Advanced Methods in Mathematical Finance (3)
 FINN 6217 - Blockchain, Cryptocurrencies, and Decentralized Finance (3)
 MATH 6204 - Computational Methods for Asset Pricing (3)
 STAT 6115 - Statistical Learning with Big Data (3)

Students will take 1-3 of the following courses based on courses transferred from NTHU:

FINN 6203 - Financial Economic Theory (3)
 FINN 6211 - Fixed Income Securities and Credit Risk (3)
 FINN 6219 - Financial Econometrics (3)
 or ECON 6219 - Financial Econometrics (3)
 MATH 6203 - Stochastic Calculus for Finance I (3)

NTHU Courses

The following courses offered by the program at NTHU can be used to replace corresponding courses offered by the program at UNC Charlotte, and each course will transfer to UNC Charlotte as a total of 3 credit hours:

- Financial Econometrics
- Stochastic Financial Theory
- Mathematical Finance
- Financial Product Design and Pricing

Credit for the above mentioned courses can be transferred to UNC Charlotte if an equivalent grade of B or better is earned.

Capstone

In addition to these courses, students are also required to pass the comprehensive exam through UNC Charlotte. However, NTHU students may substitute the UNC Charlotte Comprehensive Exam with the NTHU Thesis.

Degree Total = 30 Credit Hours

MANAGEMENT

• M.S. in Management

Department of Management

belkcollege.charlotte.edu/departments/management

Graduate Program

management.charlotte.edu

M.S. in Management

The Master of Science in Management is a full-time, one-year, 30 credit hour program. The fifth-year M.S. in Management program is designed for recent graduates without a business background who are interested in gaining marketable skills in functional areas of business. The curriculum provides students with a comprehensive overview of key business topics, making graduates marketable in today's business world. Students learn the fundamentals of business in areas such as finance, business analytics, marketing, operations, accounting, economics, information technology, ethics, organizational behavior, and leadership.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in the M.S. in Management program:

- An earned bachelor's degree from a college or university that is accredited by U.S. Department of Education-recognized institutional accreditors in a non-business field
- One letter of recommendation
- A professional résumé

Students are admitted to the program by the Dean of the Graduate School based on the recommendation of the Belk College of Business M.S. in Management Program Director, in consultation with the Belk College of Business M.S. in Management Program Committee. Recommendations are based on the assessments of the Program Director and Program Committee of the candidate's ability to complete the program, as supported by the application materials. If there are more candidates than can be accommodated, candidates are recommended in order of their perceived ability, promise of success, and suitability to the program.

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required.

Prerequisite Course Requirement

Students are required to complete a college algebra course earning a grade of B or above prior to enrolling in the program.

Degree Requirements

The M.S. in Management degree program is comprised of 30 credit hours of coursework. The M.S. in Management is a one year, lockstep program consisting of ten 3-credit hour courses. Up to 6 credit hours of coursework may be transferred from an AACSB-accredited institution of equivalent, based on the recommendation of the relevant academic department, approval of the Director of the M.S. in Management Program, and approval of the Graduate School. All students in the program must meet the Graduate School's requirements for a master's degree.

Required Courses

MSMG 6100 - Quantitative Business Analysis (3)
 MSMG 6110 - Principles of Financial and Managerial Accounting (3)
 MSMG 6120 - Management and Organizational Behavior (3)
 MSMG 6130 - Economics for Managers (3)
 MSMG 6140 - Information Systems Management (3)
 MSMG 6150 - Managing Talent for Strategic Advantage (3)
 MSMG 6160 - Marketing from a Management Perspective (3)
 MSMG 6170 - Analysis for Financial Management (3)
 MSMG 6180 - Managing Your Organization's Operations (3)
 MSMG 6190 - Managerial Ethics and Leadership (3)

Seminar Course

This seminar course is offered in the Summer II, Fall, and Spring semesters. Students are required to register for it in all three semesters. It is graded on a Pass/Unsatisfactory basis.

MSMG 6690 - Career/Professional Development Seminar (0)

Degree Total = 30 Credit Hours

Grade Requirements

Students are expected to earn an A or B in all courses included in the program and must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale) to graduate. An accumulation of three marginal C grades in any graduate coursework will result in suspension of the student's enrollment. If a student earns a U in any course, their enrollment will be suspended and the student cannot take further coursework without being readmitted to the program. Readmission to the program requires approval of the Dean of the Graduate School upon the recommendation of the Program Director.

Admission to Candidacy

Students should consult the Degree Requirements and Academic Policies section of the *Graduate Catalog* for deadlines and processes related to admission to candidacy.

Application for Degree

Students should consult Degree Requirements and Academic Policies section of the *Graduate Catalog* for deadlines and processes related to application for degree.

Advising

Academic Advising is provided by both the Director of the M.S. in Management program and Belk College Graduate Programs staff.

Transfer Credit

Up to 6 credit hours of appropriate graduate credit may be accepted for transfer from another AACSB-accredited (or equivalent) Master's program. Only courses where grades of B or above have been earned will be considered. Approval from the Director of the M.S. in Management program and the Graduate School is also required. All other Graduate School policies regarding transfer credit apply.

Program Certifications/Accreditation

The Belk College of Business is accredited by the Association to Advance Collegiate Schools of Business (AACSB International).

MATHEMATICAL FINANCE

- **M.S. in Mathematical Finance**
 - Computational Finance
 - Risk Management
 - Financial Data Analytics
- **M.S. in Mathematical Finance/Master of Business Administration (MBA) Dual Degree**
- **M.S. in Mathematical Finance/M.S. in Economics Dual Degree**
- **M.S. in Mathematical Finance/Laurea Magistrale (LM) in Banking and Finance Dual Degree (Italy)** (*see the Global Business section*)
- **M.S. in Mathematical Finance/Master's in Finance Dual Degree (China)** (*see the Global Business section*)
- **M.S. in Mathematical Finance/Master's in Quantitative Finance (Taiwan)** (*see the Global Business section*)

Graduate Program

mathfinance.charlotte.edu

M.S. in Mathematical Finance

The Master of Science in Mathematical Finance program is designed to prepare students to pursue careers in quantitative finance. Increasingly firms of all types, but especially financial institutions, investment banks, and commodities firms, rely upon highly sophisticated mathematical models to identify, measure, and manage risk. The advent of these models triggered the emergence of a new discipline, Mathematical Finance. This discipline, sometimes also referred to as “financial engineering,” “computational finance,” or “quantitative finance,” requires professionals with extensive skills in both finance and mathematics.

The Mathematical Finance program at UNC Charlotte is a joint program of the Departments of Finance and Economics in the Belk College of Business and the Department of Mathematics and Statistics in the Klein College of Science. Students take courses from all three departments in an integrated curriculum. Students may

use electives to tailor the program to their specific interests.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for admission to the Master of Science in Mathematical Finance program.

- 1) A baccalaureate degree in a related field with a minimum GPA of 3.0 on a 4.0 scale.
- 2) Acceptable scores on each portion of the GRE or GMAT.
- 3) For applicants from non-English speaking countries, a language requirement score of 557 on the TOEFL or 78% on the MELAB. Non-native speakers of English, may, at the discretion of either the Graduate School or the Program Committee for the MS in Mathematical Finance, be required to enroll in English as a Second Language (ESL) courses at the English Language Training Institute.
- 4) Specific coursework equivalent to the following: introductory course in the Theory of Finance; a standard two-semester sequence in Calculus; Linear algebra; and at least one upper-level course in Probability and Statistics. Students are strongly recommended to be familiar with at least one programming language, most preferably Python. Students lacking this coursework may be admitted subject to the condition that they satisfactorily complete such coursework during the first two semesters that they are enrolled in the program and prior to their taking any program courses where prerequisites are missing.

GMAT/GRE Waiver

The GMAT/GRE application requirement may be waived for applicants meeting the following criteria:

- Early Entry Applicants – undergraduate GPA of 3.2 or above, with grades of A or B in Economics, Math, Stats, and/or Finance courses
- General Applicants – a minimum of three years of domestic work experience in finance, quantitative analysis, computer science or other highly quantitative/analytical field with an undergraduate GPA of 3.0. OR five or more years of international work experience in finance, quantitative analysis, computer science, or other highly quantitative/analytical field with a minimum 3.0 UGPA
- Graduate Certificate in Applied Econometrics Certificate or M.S. in Economics students who have completed a minimum of two courses earning grades of B or above, and have a graduate GPA of 3.0 or above.

The waiver must be requested from the M.S. in Mathematical Finance Graduate Program Director when submitting the completed application. All GMAT/GRE waivers are at the discretion of the Graduate Program Director. If candidates are unable to secure the GMAT/GRE waiver, they are required to submit official GMAT/GRE test scores in their M.S. in Mathematical Finance program application.

Prerequisite Requirements

Students may enter this program from a variety of undergraduate backgrounds, including finance, mathematics, economics, computer science, actuarial science, statistics, information systems and engineering. As a result, many students admitted will not have the required background to immediately begin taking advanced courses from each of three areas of study. In such cases, the student may be required to take prerequisite courses prior to enrolling in advanced courses in specific fields. These prerequisites would be in addition to the advanced 30 credit hours required for the degree. In general students must have the following background in each field before taking advanced courses in that field:

- 1) Finance: Have earned an acceptable grade in an introductory course in finance from an AACSB-accredited business school at either the undergraduate or MBA level.
- 2) Economics: Have earned an acceptable grade in microeconomics at either the undergraduate or MBA level.
- 3) Mathematics: Have earned acceptable grades in the equivalent of a two course sequence in calculus (differential and integral calculus), a course in linear algebra, and an upper-level course in probability and statistics.

Students are strongly recommended to be familiar with at least one programming language, most preferably C or Python. Again, students may be admitted to the program without meeting all of these requirements. The Program Director, in conjunction with the Departmental Graduate Coordinators, will evaluate each incoming student's academic background to determine in which prerequisite courses the student will be required to enroll. A student who meets the prerequisites in a field may begin taking advanced courses in that field while still taking prerequisite courses in another field. A student must, however, be making satisfactory progress toward fulfilling his or her prerequisites in all fields to remain enrolled in the program.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree

Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Accelerated Master's Program

Academically talented high school seniors and UNC Charlotte undergraduate freshmen are encouraged to apply for the Accelerated Master's Program to begin work toward both undergraduate and graduate degrees in their Freshman year. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Accelerated Master's Programs.

Degree Requirements

A minimum of 30 credit hours of coursework beyond the bachelor's degree is required to earn the M.S. in Mathematical Finance degree. Students must complete the required six Program Core courses and four Concentration courses corresponding with the selected concentration.

Core Courses (18 credit hours)

ECON 6203 - Financial Economic Theory (3)
 or FINN 6203 - Financial Economic Theory (3)
 ECON 6113 - Cross-Section and Time Series Econometrics (3)
 or STAT 6113 - Cross-Section and Time Series Econometrics (3)
 FINN 6219 - Financial Econometrics (3)
 or ECON 6219 - Financial Econometrics (3)
 FINN 6210 - Financial Elements of Derivatives (3)
 FINN 6211 - Fixed Income Securities and Credit Risk (3)
 MATH 6203 - Stochastic Calculus for Finance (3)

Concentrations (12 credit hours)

The degree program offers three concentrations leading to a M.S. in Mathematical Finance. Students who plan to pursue careers in quantitative modeling and pricing analysis are encouraged to elect the FinTech and Quantitative Finance Concentration. Students planning to pursue a career in risk management and insurance are encouraged to pursue the program with the Risk Management Concentration. Students interested in a career in financial data analysis and applications are encouraged to elect the Financial Data Analytics concentration.

Concentration in FinTech and Quantitative Finance

In addition to the six Program Core courses, the following four courses are required for a M.S. in Mathematical Finance with a Concentration in FinTech and Quantitative Finance.

MATH 6204 - Numerical Methods for Financial Derivatives (3)

FINN 6212 - Advanced Methods in Mathematical Finance (3)

FINN 6217 - Blockchain, Cryptocurrencies, and Decentralized Finance (3)

STAT 6115 - Statistical Learning with Big Data (3)

Concentration in Risk Management

In addition to the six Program Core courses, the following four courses are required for a M.S. in Mathematical Finance with a Concentration in Risk Management.

FINN 6213 - Risk Management and Financial Institutions (3)

FINN 6214 - Asset and Portfolio Management (3)

FINN 6215 - Risk Management in Insurance Companies (3)

FINN 6216 - Quantitative Risk Management (3)

Concentration in Financial Data Analytics

In addition to the six Program Core courses, the following four courses are required for a M.S. in Mathematical Finance with a Concentration in Financial Data Analytics.

ECON 6217 - Advanced Microeconometrics (3)

ITCS 6114 - Algorithm and Data Structures (3)

ITCS 6160 - Database Systems (3)

or ITIS 6120 Applied Databases

STAT 6115 - Statistical Learning with Big Data (3)

Degree Total = 30 Credit Hours

Advising

Advising is done by the Program Director, in conjunction with the Area Coordinators of each of the participating Departments.

Assistantships

A number of assistantships are available each year. In order to be competitive, applications should be submitted by March 15. Additional information is available from the Program Director.

Comprehensive Examination

Student will be required to pass a comprehensive examination. An examining committee will be appointed by the program director and will be constituted from the program's faculty. The exam may be, at the committee's discretion, either written or oral.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Transfer Credit

No more than 6 credit hours and only courses with a grade of A or B at an accredited institution. Requires the recommendation of the Program Director and approval of the Graduate School.

M.S. in Mathematical Finance/ Master of Business Administration (MBA) Dual Degree

This dual degree program allows students to earn both a Master of Science in Mathematical Finance (MAFI) degree and a Master of Business Administration (MBA) degree from the Belk College of Business.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived.

See Mathematical Finance, M.S. and Business

Administration, M.B.A. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Mathematical Finance, M.S. and Business Administration, M.B.A.) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Mathematical Finance, M.S., Financial Data Analytics Concentration

The Mathematical Finance, M.S. program allows 6 credits to be shared from Business Administration, M.B.A. as follows:

Degree Requirement(s)	MBA Course(s) Allowed	Credits
ECON 6217	ECON 6217	3
STAT 6115	MBAD 6122	3

Business Administration, M.B.A., Quantitative Methods for Business Concentration

The Business Administration, MBA program allows 6 credits to be shared from Mathematical Finance as follows:

Degree Requirement(s)	Mathematical Finance Course(s) Allowed	Credits
ECON 6112	ECON 6113	3
ECON 6218	ECON 6219	3

Capstone Experiences

The following Capstone Experiences are required:

- **Master of Business Administration:** Students are required to take MBAD 6194.
- **M.S. in Mathematical Finance:** Students are required to pass a comprehensive examination. An examining committee is appointed by the Graduate Program Director and is constituted from the program's faculty. The exam may be, at the committee's discretion, either written or oral.

Dual Degree Total = 54 Credit Hours

Grade Requirements

Graduate students must have a 3.0 GPA in the courses on their degree plan of study in order to graduate.

M.S. in Mathematical Finance/ M.S. in Economics Dual Degree

This dual degree program allows students to earn both a Master of Science in Mathematical Finance (MAFI) degree and a Master of Science in Economics (MSE) from the Belk College of Business.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission

requirements established by the Graduate School or by either individual program may be waived. See Mathematical Finance, M.S. and Economics, M.S. (Quantitative Financial Economics Concentration) sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Mathematical Finance, M.S. and Economics, M.S. – Quantitative Financial Economics Concentration) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Mathematical Finance, M.S.

The Mathematical Finance, M.S. program allows 9 credits to be shared from Economics, M.S. (Quantitative Financial Economics Concentration) as follows:

Degree Requirement(s)	ECON Course(s) Allowed	Credits
FINN 6203 or ECON 6203	FINN 6203 or ECON 6203	3
FINN 6210	FINN 6210	3
FINN 6211	FINN 6211	3

Economics, M.S. – Quantitative Financial Economics Concentration

The Economics, M.S. (Quantitative Financial Economics Concentration) program allows 6 credits to be shared from Mathematical Finance, M.S. as follows:

Degree Requirement(s)	MAFI Course(s) Allowed	Credits
ECON 6112	ECON 6113 or STAT 6113	3
FINN 6219 or ECON 6219	ECON 6219 Or FINN 6219	3

Capstone Experiences

The following Capstone Experiences are required:

M.S. in Economics - Quantitative Financial Economics

Concentration: Thesis option OR Research Project option.

Students who choose the thesis option must successfully complete six credit hours of ECON 6999 - Graduate Thesis Research. The thesis must be written and defended within seven calendar years after admission into the M.S. in Economics program. The Thesis Committee, which must be approved by the Graduate Program Director, will consist of a Chair and at least two other faculty members.

Students who choose the research project option must complete the following research courses:

ECON 6901 - Research Methods for Economists I (3)
ECON 6902 - Research Methods for Economists II (3)

M.S. in Mathematical Finance: Comprehensive Examination.

Students are required to pass a comprehensive examination. An examining committee is appointed by the Graduate Program Director and is constituted from the program's faculty. The exam may be, at the committee's discretion, either written or oral.

Dual Degree Total = 45 Credit Hours

Grade Requirements

Graduate students must have a 3.0 GPA in the courses on their degree plan of study in order to graduate.

REAL ESTATE AND DEVELOPMENT

- M.S. in Real Estate (MSRE)
- M.S. in Real Estate/MBA Dual Degree
- MBA with Concentration in Real Estate Finance and Development (*see Business Administration section*)
- MBA Plus with Concentration in Real Estate Finance and Development (*see Business Administration section*)
- M.S. in Economics with Concentration in Urban Economics and Real Estate (*see Economics section*)
- Graduate Certificate in Real Estate and Development

Graduate Program

realestate.charlotte.edu

M.S. in Real Estate

The Master of Science degree in Real Estate (MSRE) is designed to provide students with the skills necessary to analyze, evaluate and execute complex real estate investment and development transactions. The curriculum draws from academic disciplines such as architecture, engineering, finance, and geography to emphasize the multidisciplinary nature of the real estate industry and the diverse skill set required for success. Students graduating from the program will have the skills necessary to qualify for positions such as development associates, underwriters, brokers, asset and property managers, acquisition specialists, and financial analysts.

MSRE courses are scheduled to accommodate both full-time and part-time students. The program is structured to allow full-time students to complete the curriculum within one calendar year. All courses required to complete the curriculum are offered in the evening at UNC Charlotte's Center City Campus.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Real Estate:

- 1) A general satisfactory undergraduate record from a college or university accredited by an accepted accrediting body and an undergraduate GPA of at least 3.0
- 2) A satisfactory score on the Graduate Management Admission Test (GMAT) or the Graduate Record Examination (GRE)
- 3) A satisfactory score on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) for applicants from non-English speaking countries
- 4) A full resume or a description of significant work experience

GMAT/GRE Waiver

To be eligible for a GMAT/GRE waiver, candidates must fully satisfy the requirements of one of the following options:

Option A

- Minimum 3.5 cumulative GPA (graduate or undergraduate) from an accredited institution
- Only candidates with significant quantitative coursework will be considered

Option B

- Minimum 3.0 cumulative GPA (graduate or undergraduate) from an accredited institution
- Candidates must possess 5 years of professional in a relative field or military experience that demonstrates applied and analytical skills (significant leadership experience is a plus)

Degree Requirements

The MSRE degree requires the completion of a 32 graduate credit hours. Necessary preparatory work will be determined during the admissions process and students will be advised accordingly. All students in the program must meet the Graduate School's requirements for a Master's Degree.

Required Core Courses (21.5 credit hours)

MSRE 6100 - Real Estate Seminar Fall (1)
 MSRE 6101 - Real Estate Seminar - Spring (1)
 MSRE 6102 - International Real Estate Study Tour (3) **
 MSRE 6120 - Real Estate Law (1.5)
 MSRE 6158 - Real Estate Finance and Investment (3)
 or MBAD 6158 - Real Estate Finance and Investment (0 to 3)
 MSRE 6160 - Real Estate Capital Markets (3)
 or MBAD 6160 - Real Estate Capital Markets (0 to 3)
 MSRE 6220 - Financial Analysis of Real Estate Investments (1.5)
 MSRE 6245 - Real Estate Market Analysis (1 to 5)
 MSRE 6258 - Site Feasibility Analysis (3)
 MSRE 6999 - Real Estate Capstone (3)

**MSRE 6100 and MSRE 6101 are one credit hour courses, offered in the Spring, that students must complete before graduation. Students enrolled in each course will be required to participate in real estate trade organization meetings, engage in leadership and negotiation training, attend guest lectures covering emerging trends in real estate and ethical business practices, and complete professional development seminars.*

***MSRE 6102 is a study abroad experience that requires students to travel to an international real estate market and examine local real estate development practices over the course of one week.*

****MSRE 6230 is not part of the required courses in the curriculum but, when offered, may substitute for another course at the discretion of the Director of the M.S. in Real Estate Program.*

****Students may also elect to take MSRE 6258 in lieu of MSRE 6238. All other courses included in the functional component of the curriculum must be completed by MSRE students unless otherwise stated.*

Elective Courses (10.5 credit hours)

Select from the following:

MSRE 6130 - Site Planning (1.5)
 MSRE 6152 - Financial Management (3)
 or MBAD 6152 - Financial Management (0 to 3)
 MSRE 6159 - Real Estate Development (3)
 or MBAD 6159 - Real Estate Development (0 to 3)
 MSRE 6210 - Student Managed Real Estate Investment Fund I (3)
 MSRE 6211 - Student Managed Real Estate Investment Fund II (3)
 MSRE 6230 - Construction Management (1.5)
 MSRE 6238 - Real Estate and Urban Economics (3)
 MSRE 6240 - Real Estate Valuation Methods (3)
 MSRE 6242 - Asset Management (3)
 or MSRE 6310 - Land Use Policy (1.5)

Degree Total = 32 Credit Hours

Advising

Advising is provided by the Graduate Program Director of the MSRE program and Belk College of Graduate Programs Office.

Transfer Credit

Up to six hours of appropriate graduate credit may be accepted for transfer from another AACSB-accredited (or equivalent) graduate program. Only courses where grades of B or above have been earned will be considered. Approval of the Program Director and the Graduate School is also required. All other Graduate School policies regarding transfer credit apply.

Program Certifications/Accreditation

The MSRE Program and all degree and certificate programs offered by the Belk College of Business are accredited by the Association to Advance Collegiate Schools of Business (AACSB-International).

M.S. in Real Estate/Master of Business Administration (MBA) Dual Degree

This dual degree program allows students to earn both a Master of Science in Real Estate (MSRE) and Master of Business Administration (MBA) degree from the Belk College of Business. A dual degree equips students with both general business skills and specific knowledge and expertise in real estate, which better prepares students for a successful career in the future.

This dual degree program is not available to students in the M.B.A., Real Estate Finance and Development Concentration.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Real Estate, M.S.R.E. and Business Administration, M.B.A. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Real Estate, M.S.R.E. and Business Administration, M.B.A.) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Real Estate, M.S.R.E.

The Real Estate, M.S.R.E. program allows 6 credits to be shared from Business Administration, MBA as follows:

Degree Requirement(s)	MBA Course(s) Allowed	Credits
MSRE 6152	MBAD 6152	3
Electives	Any MBAD Elective	3

Business Administration, M.B.A.

The Business Administration, MBA program allows 6 credits to be shared from Real Estate, M.S.R.E. as follows:

Degree Requirement(s)	MSRE Course(s) Allowed	Credits
Concentration Elective	MSRE 6158	3
Concentration Elective	MSRE 6159	3

Capstone Courses

MBAD 6194 - Global Strategic Management (0 to 3)
MSRE 6999 - Real Estate Capstone (3)

Degree Total = 56 Credit Hours

Grade Requirements

Students must have a cumulative 3.0 GPA to graduate from the dual degree program.

Graduate Certificate in Real Estate and Development

The Graduate Certificate in Real Estate and Development requires completion of 15 credit hours of 6000-level courses in real estate finance and development. Transfer credits are not accepted into the Graduate Certificate in Real Estate Finance and Development program. Students must earn a grade of B or above in all courses that make up the certificate program.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Real Estate and Development:

- 1) A generally satisfactory undergraduate record from an accredited college or university
- 2) Basic proficiency in using spreadsheet computer software
- 3) Preparatory work in accounting, finance, and economics

Note: MBA students concentrating in real estate finance and development are ineligible to enroll in the Graduate Certificate in Real Estate and Development program.

Applications are reviewed on a continuous basis. Participants may enroll for the first time in Fall or Spring terms.

Certificate Requirements

This 15-credit certificate program consists of:

Core Requirement (3 credit hours)

MSRE 6220 - Financial Analysis of Real Estate

Investments (1.5)

and

MSRE 6245 - Real Estate Market Analysis (1 to 5)

Elective Courses (12 credit hours)

Select 12 credit hours from the following:

Investment Electives

MSRE 6158 - Real Estate Finance and Investment (3)

MSRE 6160 - Real Estate Capital Markets (3)

MSRE 6210 - Student Managed Real Estate Investment
Fund I (3)

MSRE 6211 - Student Managed Real Estate Investment
Fund II (3)

MSRE 6240 - Real Estate Valuation Methods (3)

Asset Management Electives

MSRE 6210 - Student Managed Real Estate Investment
Fund I (3)

MSRE 6211 - Student Managed Real Estate Investment
Fund II (3)

MSRE 6238 - Real Estate and Urban Economics (3)

MSRE 6242 - Asset Management (3)

Development Electives

MSRE 6120 - Real Estate Law (1.5)

MSRE 6130 - Site Planning (1.5)

MSRE 6230 - Construction Management (1.5)

MSRE 6258 - Site Feasibility Analysis (3)

MSRE 6310 - Land Use Policy (1.5)

Certificate Total = 15 Credit Hours



College of Computing and Informatics

cci.charlotte.edu

The College of Computing and Informatics at the University of North Carolina at Charlotte aspires to be a national leader in advancing the role of computing and informatics as a catalyst for the 21st Century economy. As the only school of its kind in the Carolinas, students are prepared to shape the future of computing by participating in educational and research programs that respond directly to the needs of business and government. Its research and educational programs offer students a combination of strong technical knowledge with broad domain understanding and workforce skills. The world has become a computing and informatics-based society. All industries require computing and informatics talent. The demand for computing and informatics talent and innovation will continue to grow. The UNC Charlotte College of Computing and Informatics advances the field with its combination of the latest science, industry expertise, and dedicated faculty and students. The College is designated as a National Center of Academic Excellence in Cyber Defense and Cyber Research by the National Security Agency and the U.S. Department of Homeland Security. Hard at work on a full spectrum of research topics, the College of Computing and Informatics has broken new ground in bioinformatics, computer security, data and visual analytics, data science, health informatics, human-centered computing, information technology, robotics, and visualization applications.

CCI's mission is to empower people to shape the future through computing education, research, and engagement.

Areas of interest to College of Computing and Informatics researchers include: Access Control, Artificial Intelligence (AI), Authentication and Identification, Bioinformatics, Communication Networks, Complex Adaptive Systems, Computational Biophysics, Computational Mass Spectrometry, Computer Architecture, Computer Graphics, Computer Vision, Cryptography and Applications, Data Mining, Enterprise Security, Enterprising Integration, Evolutionary Computation, Genome Annotation, Genome Wide Association Analysis, Human Computer Interaction, Image/Video Processing, Information Security and Assurance, Insider Threat Prevention and Detection, Intelligent Systems, Intrusion Prevention and Detection, Knowledge Based Systems, Knowledge Discovery, Machine Learning, Metagenomics, Modeling and Simulation of Information Infrastructure, Multi-Agent Systems, Multimedia Databases, Natural Language Processing, Network and Distributed Systems Security, Neural Networks, Privacy Preserving Technology, Provably Secure Systems, Robotics, Scientific and Information Visualization, Security Protocols, Soft Computing, Software Engineering, Software Verification and Validation, Software Testing, Structural Bioinformatics, Survivable Security Systems, Systems Biology, Virtual Reality, Web Security, Wireless Networks, and Wireless

Security.

Graduate Degree Programs

- Ph.D. in Bioinformatics and Computational Biology
- Ph.D. in Computing and Information Systems
- Ph.D. in Data Science
- M.S. in Bioinformatics
- M.S. in Computer Science
- M.S. in Cybersecurity
- M.S. in Data Science and Business Analytics
- M.S. in Health Informatics and Analytics
- M.S. in Information Technology
- Master of Architecture and M.S. in Information Technology Dual Degree

Graduate Non-Degree Programs

- Graduate Certificate in Applied Artificial Intelligence
- Graduate Certificate in Bioinformatics Technology
- Graduate Certificate in Data Science and Business Analytics
- Graduate Certificate in Game Design and Development
- Graduate Certificate in Health Informatics and Analytics
- Graduate Certificate in Human-Computer Interaction
- Graduate Certificate in Information Security and Privacy
- Graduate Certificate in Information Technology Management
- Graduate Certificate in Software Development

BIOINFORMATICS AND GENOMICS

- Ph.D. in Bioinformatics and Computational Biology
- M.S. in Bioinformatics
- Graduate Certificate in Bioinformatics Technology

Department of Bioinformatics and Genomics

<https://cci.charlotte.edu/departments/departments-of-bioinformatics-and-genomics/>

Ph.D. in Bioinformatics and Computational Biology

The Ph.D. in Bioinformatics and Computational Biology (BCB) is granted for planning, execution, and defense of original research resulting in significant contributions to the discipline's body of knowledge. Moreover, the BCB Ph.D. program also requires didactic coursework to prepare the student for research success. Student progress is primarily assessed by: (a) satisfactory coursework performance, (b) the Qualifying Examination, (c) the Dissertation Proposal, and (d) the Dissertation Defense. Courses and the Qualifying Examination are used to ensure that the student has sufficient breadth of knowledge. The Dissertation Proposal is used to ensure that the scope of dissertation research is important, that the plan is well thought out and that the student has sufficient skills and thoughtfulness needed for success. The Dissertation Defense is used to assess the outcomes of the dissertation research, and whether or not the plan agreed upon by the Dissertation Committee has been appropriately followed.

Admissions Requirements

The Ph.D. in Bioinformatics and Computational Biology admits students on a competitive basis. Preference is given to applicants with strong credentials and appropriate undergraduate and/or professional preparation.

- A baccalaureate degree from an institution accredited by an accepted accrediting body. Admission requirements for Bioinformatics track will include an adequate preparation in chemistry, biology, mathematics (preferably statistics), and computer science. Strong candidates may be allowed to make up deficiencies in some areas at the discretion of the Bioinformatics admissions subcommittee.
- Evidence of scholarly and creative activity, including

publication list; awards; results in national or international contests, and the like

- A minimum GPA of 3.0 (on a 4.0 scale)
- Excellent GRE scores
- Three letters of reference from professionals working in the applicant's field of interest that addresses the applicant's previous experience and potential to do research
- Personal statement. Please include answers to the following questions:

- 1) What area(s) of research in Bioinformatics and Genomics are you most interested in? Which faculty members in the department would you most like to work with in order to further pursue these areas? Please discuss at least 3 different faculty, but no more than five.
- 2) Why have you chosen to apply to this particular program? What are your career goals, and how will a degree from this program help you achieve those goals?
- 3) What kind of prior experience do you have that you feel has prepared you for graduate-level research? If you have done research as an undergraduate, please tell us about the questions you were aiming to answer, your role in the research project, and what the outcome was. If you have not done research as an undergraduate, tell us instead about other projects or work efforts that you led, and what you did to accomplish the project goals.
- 4) What kind of technical skills do you have that are most relevant to the Ph.D. program in Bioinformatics and Genomics?
- 5) What would you describe as your biggest personal strengths? How do you feel these strengths will increase your chance of success in a Ph.D. program?

GRE Waiver

The GRE can be waived if one of the following conditions are met:

- 1) Applicant obtained, or will complete prior to enrollment, a M.S. degree from a college or university in the U.S. accredited by an accepted accrediting body, with a GPA of 3.2 or higher, in a STEM major related to Bioinformatics and Genomics
- 2) Applicant obtained, or will complete prior to enrollment, a B.S. degree from an accredited U.S. institution, with a GPA of 3.4 or higher, in a STEM major related to Bioinformatics and Genomics

Please note: a waiver of the GRE requirement does not constitute an offer of admission into the program.

Degree Requirements

The BCB program requires 72 credit hours in 8000-level BINF courses, or prior approved substitutions. All students must complete two Research Rotations in the first year of the program; each provides a semester of faculty supervised research experience to supplement regular course offerings. Students must complete the Core Courses prior to taking the Qualifying Exam. In consultation with their Academic Advisor and/or Program Director, students frequently also take an appropriate selection of the Gateway Courses in order to be prepared for the Core Courses. For example, an incoming student with a Computer Science background would be expected to take BINF 8100 and BINF 8101, but not BINF 8111. All students must complete the Core Courses prior to taking the Qualifying Examination. Graduate Research Seminar is taken every semester until the semester following advancement to candidacy. Finally, many additional Elective Courses are available, but are not explicitly required.

Gateway Courses

(as needed, based on student's background)

BINF 8100 - Biological Basis of Bioinformatics (3)

BINF 8101 - Energy and Interaction in Biological Modeling (3)

BINF 8111 - Bioinformatics Programming I (3)

Core Courses

BINF 8112 - Bioinformatics Programming II (3)

BINF 8200 - Statistics for Bioinformatics (3)

BINF 8201 - Molecular Sequence Analysis (3)

Students must choose one additional elective at the 8200 level.

Research Rotations

BINF 8911 - Research Rotation I (2)

BINF 8912 - Research Rotation II (2)

Graduate Research Seminar

BINF 8600 - Bioinformatics Seminar (1) *(Must be taken every semester until the semester following advancement to candidacy)*

Research Hours

BINF 8991 - Doctoral Dissertation Research (1 to 9) *(Must take a minimum of 18 hours)*

Responsible Conduct of Research

Select one of the following

GRAD 8302 - Responsible Conduct of Research (2)

BINF 8151 - Professional Communications (1)

Molecular Biophysics Concentration – Optional (8 credit hours)

PHYS 6108 - Biophysics (3)

or OPTI 8000 - Selected Topics in Optics (3)

PHYS 6204 - Methods of Molecular Modeling and Simulation in Physics (3)

or BINF 8311 - Biophysical Modeling (3)

PHYS 6610 - Biophysics Seminar (1) *(to be taken twice)***Elective Courses**

Any graduate level BINF prefix course may be taken as a pre-approved elective. Other courses may be taken with department approval.

Degree Total = 72 Credit Hours**Qualifying Examination**

Prior to defining a research topic, students are required to pass a Qualifying Examination to demonstrate proficiency in bioinformatics and computational biology, as well as competence in fundamentals common to the field. The Qualifying Examination must be passed prior to the fifth semester of residence. It is composed of both written and oral components that emphasize material covered in the Core Courses listed above.

Dissertation Proposal

Each student must present and defend a Ph.D. Dissertation Research Proposal within two semesters of passing the Qualifying Examination. The Dissertation Proposal defense will be conducted by the student's Dissertation Committee, and will be open to faculty and students. The proposal must address a significant, original and substantive piece of research. The proposal must include sufficient preliminary data and a timeline such that the Dissertation Committee can assess its feasibility.

Dissertation

Each student must complete a well-designed original research contribution, as agreed upon by the student and Dissertation Committee at the Dissertation Proposal. The Ph.D. Dissertation is a written document describing the research and its results, and their context in the sub-discipline. The Dissertation Defense is a public presentation of the findings of the research, with any novel methods that may have been developed to support the conclusions. The student must present the Dissertation and defend its findings publicly, and in a private session with the Dissertation Committee immediately thereafter.

M.S. in Bioinformatics

A unique master's degree merging the biological sciences and computer technology, the M.S. in Bioinformatics is an interdisciplinary program at the intersection of the disciplines of Biology, Chemistry, Mathematics and Statistics, Computing and Informatics, and Engineering. It is expected that students entering the program will have completed an undergraduate major in either a life science or a quantitative discipline. The degree requires additional training and demonstrated competence in both life sciences and scientific programming. The M.S. in Bioinformatics program is structured to provide students with the skills and knowledge to develop, evaluate, and deploy bioinformatics and computational biology applications. The program is designed to prepare students for employment in the biotechnology sector, where the need for knowledgeable life scientists with quantitative and computational skills has exploded in the past decade.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for study toward the M.S. in Bioinformatics:

Under most circumstances, students admitted to the program will have:

- A baccalaureate degree from a college or university accredited by an accepted accrediting body in Biology, Biochemistry, Chemistry, Physics, Mathematics, Statistics, Computer Science, or another related field that provides a sound background in life sciences, computing, or both
- A minimum undergraduate GPA of 3.0 (4.0 scale) and 3.0 in the major (this requirement is waived for Early Entry program applicants who meet the University's overall GPA requirement (3.2 and 75-90 hours of completed undergraduate coursework) in Biology, Chemistry, Physics, Math, SIS or CS, or another UNC Charlotte major if the department determines the student's preparation is appropriate)
- A combined TOEFL score of 557 (paper-based) or 83 (Internet-based) is required if the previous degree was from a country where English is not the common language
- Applicants who earned a degree from an institution outside of the United States must have their transcripts evaluated by one of the current members of the National Association of Credential Evaluation Services (WES is preferred)
- Three positive letters of recommendation

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The M.S. in Bioinformatics degree requires a minimum of 35 graduate credit hours, and a minimum of 31 credit hours of formal coursework. A minimum of 24 credit hours presented toward an M.S. in Bioinformatics must be from courses numbered 6000 or higher. A maximum of 6 hours of graduate credit may be transferred from other institutions.

Because of the interdisciplinary nature of this program, which is designed to provide students with a common graduate experience during their professional preparation for the M.S. in Bioinformatics degree, all students are required to take a general curriculum that includes a two-year sequence of courses as described below:

Core Bioinformatics Courses (19 credit hours)

All students must take the following Core Courses. Students who have previously taken a course with a syllabus that closely follows one of the Core Courses may test out of the core requirement by passing a written exam, and may then substitute an advanced elective for the required Core Course.

BINF 6101 - Energy and Interaction in Biological Modeling (3)

BINF 6112 - Bioinformatics Programming II (3)

BINF 6115 - Introduction to UNIX Computing for Bioinformatics (1)

BINF 6200 - Statistics for Bioinformatics (3)

BINF 6201 - Molecular Sequence Analysis (3)

BINF 6202 - Computational Structural Biology (3)
or BINF 6203 - Genomics (3)

BINF 6211 - Design and Implementation of Bioinformatics Databases (3)

Students must choose one additional BINF elective at the 8200 level.

Gateway Courses (3 credit hours)

The department offers two intensive graduate-level courses designed to provide accelerated training in a second discipline that complements the student's undergraduate training. Students entering the program without preparatory coursework in computing or biology may need to take the Gateway course that is appropriate for their background. These courses are not required core courses for all students, but are designed to satisfy core

course prerequisites for students who have not encountered the material presented in a previous course. These courses may be counted as electives.

BINF 6100 - Biological Basis of Bioinformatics (3) (*for students with computing backgrounds*)

BINF 6111 - Bioinformatics Programming I (3) (*for students with biological science backgrounds*)

Professional Preparation Course (3 credit hours)

Students are required to take at least 3 credit hours of professional preparation courses designed to prepare them to function effectively and ethically in a professional scientific environment. Select one of the following:

BINF 5171 - Business of Biotechnology (3)

BINF 5191 - Life Sciences and the Law (3)

Elective Courses (9 credit hours)

The remaining 9 credit hours of required coursework can be satisfied by elective courses. The M.S. Graduate Coordinator, in conjunction with the Graduate Program Director, reviews the student's plan of study each semester.

Bioinformatics Elective Courses

Any BINF graduate courses are open to M.S. students seeking to complete their coursework requirements.

Recommended Elective Courses Offered By Other Departments

A wide range of graduate courses in Biology, Chemistry, Computer Science, Data Science, Health Informatics and Analytics, Software and Information Systems, and other programs may be appropriate electives for M.S. in Bioinformatics students. As course offerings change frequently, the Department of Bioinformatics and Genomics maintains a list of current recommended electives.

Bioinformatics Seminar and Research Experience (4 credit hours)

In addition to 31 credit hours of formal coursework, students are required to enroll in the Bioinformatics Program seminar (BINF 6600) for at least one semester (1 credit hour) and to enroll in either internal or external internship (BINF 6400), or a faculty-supervised original research project (BINF 6900).

BINF 6600 - Bioinformatics Seminar (1)

Plus one of the following:

BINF 6400 - Internship Project (1 to 3)

BINF 6900 - Master's Thesis (1 to 3)

Degree Total = 35 Credit Hours

Grade Requirements

An accumulation of three C grades will result in suspension of the student's enrollment in the graduate program. If a student makes a grade of U in any course, enrollment in the program will be suspended.

Transfer Credit

A maximum of 6 credit hours of coursework from other institutions will count toward the M.S. in Bioinformatics degree requirements. Only courses with grades of A or B from an institution accredited by an accepted accrediting body are eligible for transfer credit.

Graduate Certificate in Bioinformatics Technology

The Graduate Certificate in Bioinformatics Technology trains students in method development for analysis of large-scale biological data and modeling of complex biological systems, with a focus on acquiring complementary skill sets in life sciences and in programming, statistical analysis, and database development. The certificate requires thirteen (13) credit hours of coursework. The certificate may be pursued concurrently with a related graduate degree program at UNC Charlotte.

Admission Requirements

For admission into the certificate program, applicants must meet the following requirements:

- 1) A bachelor's degree in a related field, including, but not limited to, a life science, physical science, mathematics, or computing discipline.
- 2) Practical experience and confidence with computers, for instance use of common web browsers, word processing, plotting, and spreadsheet applications.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Certificate Requirements

Students will complete a total of 5 courses for the certificate, including 4 required courses and their choice of one elective. Students entering the program with prior computer programming experience may opt to substitute BINF 6112 for the BINF 6111 requirement.

Required Courses (10 credit hours)

All of the following courses are required for the Bioinformatics Certificate:

BINF 6111 - Bioinformatics Programming I (3)
 BINF 6115 - Introduction to UNIX Computing for Bioinformatics (1)
 BINF 6200 - Statistics for Bioinformatics (3)
 BINF 6201 - Molecular Sequence Analysis (3)

Elective Courses (3 credit hours)

Select one of the following courses with its accompanying lab:

BINF 6112 - Bioinformatics Programming II (3)
 BINF 6202 - Computational Structural Biology (3)
 BINF 6203 - Genomics (3)
 BINF 6205 - Computational Molecular Evolution (3)
 BINF 6210 - Machine Learning for Bioinformatics (3)
 BINF 6211 - Design and Implementation of Bioinformatics Databases (3)

Certificate Total = 13 Credit Hours

If a student wishes to enter the program having completed coursework that is equivalent to the core course requirements, the core requirements may be waived at the discretion of the certificate coordinator. In this case, the required 13 coursework hours may be selected from the electives listed above, or from other advanced graduate courses offered by the Department of Bioinformatics and Genomics.

Transfer credit may not be applied toward this certificate.

It is suggested that students in the Graduate Certificate Program arrange formal co-mentorship by a Department of Bioinformatics and Genomics faculty member, if the student is concurrently enrolled in another thesis-based degree program on campus and intends to extend or enable their thesis research through the application of bioinformatic methods.

COMPUTER SCIENCE

- **M.S. in Computer Science**
 - o AI, Robotics, and Gaming
 - o Data Science
 - o Information Security and Privacy
 - o Software, Systems, and Networks
- **Master of Architecture and M.S. in Information Technology Dual Degree**
(see under *Architecture* in the “College of Arts + Architecture” section)
- **Graduate Certificate in Applied Artificial Intelligence**
- **Graduate Certificate in Game Design and Development**

Department of Computer Science
cs.charlotte.edu

M.S. in Computer Science

The Master of Science in Computer Science program provides students advanced skills and knowledge in planning, design, implementation, testing, and management of computer systems, applications, and infrastructures. These skills form a foundation for employment in high tech industry, or doctoral study in computer science.

The active research areas in the Department of Computer Science include 3D HCI, Algorithms, Artificial Intelligence, Biomedical Imaging, Biometrics, Cloud Computing, Cognitive Science, Communication Networks, Computer Science Education, Computer Vision, Data Mining, Game Design, Graphics, Health Informatics, High Performance Computing, Information Visualization, Intelligent Systems, IoT, Knowledge Based Systems, Knowledge Discovery, Machine Learning, Natural Language Processing, Parallel Computing, Recommender Systems, Robotics, Software Engineering, Virtual Reality, Visual Analytics, and Wireless Networks.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, students applying for this program are expected to have knowledge of programming languages, data structures and algorithms, operating systems, or computer architecture. The knowledge of calculus, discrete mathematics, and linear algebra typically attained in undergraduate education is expected, too. Students without undergraduate prerequisite courses in

computer science and mathematics may be instructed to demonstrate prior knowledge, as determined by the Graduate Program Director.

A bachelor's degree in computer science is desired. Individuals who have worked as professionals in the computer industry may be able to substitute work experience for some of the specific subject area admission requirements, subject to review by the Graduate Program Director.

Students must have an undergraduate grade point average of (or equivalent to) at least 3.0 (on a 4.0 point scale) and a Junior/Senior GPA of at least 3.0. A satisfactory GRE score is required for applicants who completed undergraduate degree outside of the United States.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Master of Science in Computer Science program requires 30 graduate credit hours with a minimum 3.0 GPA, which may optionally include 6 credit hours of thesis. At least 18 credit hours of the courses applied to the degree must be from the Department of Computer Science, and at least 24 hours must be from the College of Computing and Informatics. At least 15 credit hours must be at the 6000-level or above courses. No more than 6 credit hours may be in Individual Study. A maximum of 6 credit hours of graduate credit may be transferred from other graduate degree programs.

Core Courses (12 credit hours)

Select four courses, one from each core group, to satisfy the core requirements.

Foundation of Computing Core

ITCS 5356 - Introduction to Machine Learning (3)
ITCS 6114 - Algorithms and Data Structures (3)

AI, Robotics, and Gaming Core

ITCS 5356 - Introduction to Machine Learning (3)
ITCS 6120 - Computer Graphics (3)
ITCS 6152 - Robot Motion Planning (3)
ITCS 6156 - Machine Learning (3)

Data Science and Management Core

ITCS 5122 - Visual Analytics (3)
ITCS 6162 - Data Mining (3)

ITCS 6190 - Cloud Computing for Data Analysis (3)

Systems and Networks Core

ITCS 6141 - Computer System and Architecture:

Performance and Implementation (3)

ITCS 6145 - Parallel Computing (3)

ITCS 6166 - Computer Communications and Networks (3)

Optional Concentration (9 credit hours)

Students who choose to declare a concentration must take at least 9 credit hours of courses listed in that concentration (see below). Courses used to fulfill the core requirement cannot be counted for credit in an area of concentration.

AI, Robotics, and Gaming Concentration (ARGC)

Select three of the following:

ITCS 5150 - Mobile Robotics (3)

ITCS 5153 - Applied Artificial Intelligence (3)

ITCS 5154 - Applied Machine Learning (3)

ITCS 5230 - Introduction to Game Design and Development (3)

ITCS 5231 - Advanced Game Design and Development (3)

ITCS 5232 - Game Design and Development Studio (3)

ITCS 5235 - Game Engine Construction (3)

ITCS 5236 - Artificial Intelligence for Computer Games (3)

ITCS 6050 - Topics in Artificial Intelligence (3)

ITCS 6101- Natural Language Processing (3)

ITCS 6115 - Advanced Algorithms (3)

ITCS 6120 - Computer Graphics (3)

ITCS 6150 - Intelligent Systems (3)

ITCS 6151 - Intelligent Robotics (3)

ITCS 6152 - Robot Motion Planning (3)

ITCS 6156 - Machine Learning (3)

ITCS 6169 - Computer Vision (3)

ITCS 6490 - Industrial Internship (3)

ITCS 6500 - Complex Adaptive Systems (3)

ITCS 6881 - Individual Study in AI, Robotics, and Gaming (1 to 3)

ITCS 6991 - Computer Science Thesis (1 to 3)

Data Science Concentration (DSC)

Select three of the following:

ITCS 5122 - Visual Analytics (3)

ITCS 5123 - Visualization and Visual Communication (3)

ITCS 5153 - Applied Artificial Intelligence (3)

ITCS 6040 - Topics in Data Science (3)

ITCS 6100 - Big Data Analytics for Competitive Advantage (3)

ITCS 6115 - Advanced Algorithms (3)

ITCS 6121 - Data and Information Visualization (3)

ITCS 6124 - Illustrative Visualization (3)

ITCS 6155 - Knowledge-Based Systems (3)

ITCS 6157 - Visual Databases (3)

ITCS 6160 - Database Systems (3)

ITCS 6161 - Advanced Topics in Database Systems (3)

ITCS 6162 - Data Mining (3)

ITCS 6163 - Data Warehousing (3)

ITCS 6190 - Cloud Computing for Data Analysis (3)

ITCS 6265 - Advanced Topics in Data Mining (3)

ITCS 6345 - Modern Data Science Systems (3)

ITCS 6490 - Industrial Internship (3)

ITCS 6882 - Individual Study in Data Science (1 to 3)

ITCS 6991 - Computer Science Thesis (1 to 3)

Information Security and Privacy Concentration (ISPC)

Required Course

ITIS 6200 - Principles of Information Security and Privacy (3)

Elective Courses

Select two of the following:

ITCS 6490 - Industrial Internship (3)

ITIS 5221 - Secure Programming and Penetration Testing (3)

ITIS 5250 - Computer Forensics (3)

ITIS 5260 - Introduction to Security Analytics (3)

ITIS 6150 - Software Assurance (3)

ITIS 6167 - Network Security (3)

ITIS 6210 - Access Control and Security Architecture (3)

ITIS 6214 - Usable Security and Privacy (3)

ITIS 6220 - Data Privacy (3)

ITIS 6230 - Enterprise and Infrastructure Protection (3)

ITIS 6240 - Applied Cryptography (3)

ITIS 6362 - Information Technology Ethics, Policy, and Security (3)

Systems and Networks Concentration (SNC)

Select three of the following:

ITCS 5102 - Survey of Programming Languages (3)

ITCS 5180 - Mobile Application Development (3)

ITCS 5182 - Introduction to High Performance Computing (3)

ITCS 6112 - Software System Design and Implementation (3)

ITCS 6115 - Advanced Algorithms (3)

ITCS 6132 - Modeling and Analysis of Communication Networks (3)

ITCS 6141 - Computer System and Architecture: Performance and Implementation (3)

ITCS 6145 - Parallel Computing (3)

ITCS 6166 - Computer Communications and Networks (3)

ITCS 6167 - Advanced Networking Protocols (3)

ITCS 6168 - Wireless Communication Networks (3)

ITCS 6190 - Cloud Computing for Data Analysis (3)

ITCS 6490 - Industrial Internship (3)

ITCS 6883 - Individual Study in Software, Systems, and Networks (1 to 3)

ITCS 6991 - Computer Science Thesis (1 to 3)

ITIS 5166 - Backend Application Development (3)

ITIS 5280 - Advanced Mobile Application Development (3)

ITIS 6167 - Network Security (3)

ECGR 5101 - Advanced Embedded Systems (3)

ECGR 5124 - Digital Signal Processing (3)

ECGR 6181 - Embedded Operating Systems (3)

Dual Concentration

Students may request to complete two concentrations. However, no course can count towards two concentrations.

Elective Courses (0 to 15 credit hours)

Students who select no concentration must complete 15 credit hours of elective courses. Students who select a concentration must complete 6 credit hours of elective courses. Students who chose to declare dual concentration will not need elective courses. Students may choose from the following elective courses:

ITCS 5000 - ITCS 6999
ITIS 5000 - ITIS 6999
DSBA 5000 - DSBA 6999

Capstone (3 credit hours)

Select one of the following courses. Credit hours from a capstone course may be counted towards a concentration requirement, too, if the same course is listed in that concentration. For students pursuing the M.S. Thesis, they will have to enroll in ITCS 6991 in two consecutive semesters (6 credit hours total), with the 3 credit hours satisfying the capstone requirement.

ITCS 5180 - Mobile Application Development (3)
ITCS 5231 - Advanced Game Design and Development (3)
ITCS 5232 - Game Design and Development Studio (3)
ITCS 6112 - Software System Design and Implementation (3)
ITCS 6880 - Individual Study (1 to 3)
ITCS 6881 - Individual Study in AI, Robotics, and Gaming (1 to 3)
ITCS 6882 - Individual Study in Data Science (1 to 3)
ITCS 6883 - Individual Study in Software, Systems, and Networks (1 to 3)
ITCS 6991 - Computer Science Thesis (1 to 3)
ITIS 5166 - Backend Application Development (3)

Degree Total = 30 Credit Hours**Grade Requirements**

Core Courses must each be passed with A or B grades. A minimum overall 3.0 GPA is required.

Assistantships

Financial assistance for qualified students is available on a competitive basis in the form of graduate teaching and research assistantships. All M.S. students who entered "Yes" in the application form on the question "Assistantship Interest" are automatically considered. No separate assistantship application is required.

Graduate Certificate in Applied Artificial Intelligence

The Graduate Certificate in Applied Artificial Intelligence (AAI) provides graduate students with the opportunity to reach a demonstrated level of competence in the area of Artificial Intelligence and apply such knowledge to the solution of practical problems. Coursework towards the Certificate in AAI can be used for credit towards the M.S. in Computer Science degree. However, its primary purpose is to provide a well-defined target for students who want to advance their knowledge of modern AI systems and techniques but do not necessarily wish to complete all requirements for the M.S. in Computer Science. The certificate may be pursued concurrently with any of the graduate degree programs at UNC Charlotte.

Admission Requirements

The Certificate in Applied Artificial Intelligence is open to all students who hold a B.S. degree in any scientific, engineering, or business discipline and either are enrolled and in good standing in a graduate degree program at UNC Charlotte or have GPA above 2.8 overall and 3.0 for their Junior and Senior years.

In addition, the program requires a current working knowledge of two higher-level languages, including at least one procedural language; and a familiarity with computer applications. The following minimal background in mathematics is also required: two semesters of calculus and one semester of discrete structures. Individuals who have worked at a high professional level in the computer industry may be able to substitute work experience for specific subject area admission requirements.

Certificate Requirements

The certificate will be awarded upon completion of four graduate level courses (12 credit hours) in the area of artificial intelligence, machine learning, and their applications.

Required Courses (6 credit hours)

ITCS 6114 - Algorithms and Data Structures (3)
ITCS 6150 - Intelligent Systems (3)
or ITCS 5153 - Applied Artificial Intelligence (3)

Elective Courses (6 credit hours)

Select two of the following:

ITCS 6101 - Natural Language Processing (3)
ITCS 6156 - Machine Learning (3)
or ITCS 5154 - Applied Machine Learning (3)
ITCS 6100 - Big Data Analytics for Competitive Advantage (3)
ITCS 6155 - Knowledge-Based Systems (3)

ITCS 6157 - Visual Databases (3)
 ITCS 6160 - Database Systems (3)
 ITCS 6162 - Data Mining (3)
 ITCS 6190 - Cloud Computing for Data Analysis (3)
 ITCS 6265 - Advanced Topics in Data Mining (3)
 ITCS 6881 - Individual Study in AI, Robotics, and Gaming (1 to 3)
 ITIS 5310 - Web Mining (3)
 ITIS 6220 - Data Privacy (3)

Grade Requirements

A cumulative GPA of 3.0 is required, and at most one course with a grade of C may be allowed towards the certificate.

Certificate Total = 12 Credit Hours

Graduate Certificate in Game Design and Development

The Graduate Certificate in Game Design and Development (GDD) provides graduate students with the opportunity to reach a demonstrated level of competence in game design and development. Coursework towards the certificate in GDD can be used towards the M.S. in Computer Science degree. However, its primary purpose is to provide a well-defined target for students who want to advance their knowledge of modern game design and development techniques and work with a variety of professionals, from artists to writers, to bring the vision for an interactive game or media product to life. The certificate may be pursued concurrently with any of the graduate degree programs at UNC Charlotte.

Admission Requirements

This certificate program is open to all students who hold a B.S. degree in any scientific, engineering, or business discipline and one of the following:

- 1) Are enrolled and in good standing in a graduate degree program at UNC Charlotte
- 2) Have a GPA above 2.8 overall and 3.0 Junior/Senior

In addition, the program expects a current working knowledge of two higher level languages, including at least one procedural language, and a familiarity with computer applications. The following minimal background in mathematics is compulsory: two semesters of calculus and one semester of discrete structures. Individuals who have worked at a high professional level in the computer industry may be able to substitute work experience for specific subject area admission requirements. Application for the GDD certificate program is made through the Graduate Admissions Office of the University.

Courses used to satisfy requirements of a previous degree are not acceptable. Students with significant game-related work at the undergraduate level may be allowed to substitute advanced game courses for compulsory courses at the discretion of the GDD certificate coordinators. *(Note: the admission process for the Certificate is separate from the admission process for the M.S. degree.)*

Certificate Requirements

The certificate is awarded upon completion of five graduate level courses (15 credits) in the area of game design and development. Course substitutions may be made at the discretion of the GDD Program Director.

Required Courses (12 credit hours)

ITCS 5230 - Introduction to Game Design and Development (3)
 ITCS 5231 - Advanced Game Design and Development (3)
 ITCS 5232 - Game Design and Development Studio (3)
 ITCS 6120 - Computer Graphics (3)

Elective Course (3 credit hours)

Select one of the following:

ITCS 5235 - Game Engine Construction (3)
 ITCS 5236 - Artificial Intelligence for Computer Games (3)
 Another game-related course (generally from ITCS/ITIS at the 5000 level or above) approved by the GDD Program Director

Certificate Total = 15 Credit Hours

Grade Requirements

A cumulative GPA of 3.0 is required, and at most one course with a grade of C may be allowed towards the certificate.

COMPUTING AND INFORMATION SYSTEMS

- **Ph.D. in Computing and Information Systems**
 - Bioinformatics
 - Business Information Systems and Operations Management
 - Computer Science
 - Design Computation
 - Software and Information Systems
 - Interdisciplinary

College of Computing and Informatics
cci.charlotte.edu

Ph.D. in Computing and Information Systems

The Ph.D. in Computing and Information Systems (CIS) program has six concentrations:

- 1) Bioinformatics (BINF)
- 2) Business Information Systems and Operations Management (BISOM)
- 3) Computer Science (CS)
- 4) Design Computation (DC)
- 5) Software and Information Systems (SIS)
- 6) Interdisciplinary (INT)

In addition, the Ph.D. in CIS offers an Advanced Standing Option for the Concentrations in CS and SIS for students who have already earned a Master's degree in selected disciplines.

The program is staffed with a multidisciplinary faculty and offers opportunities for students to develop advanced competencies in a number of CIS-related fields. Faculty from the Departments of Computer Science, Software and Information Systems, Bioinformatics and Genomics, and Business Information Systems and Operations Management form its core. Students, in cooperation with faculty advisors, design flexible programs of study tailored to address individual career goals.

Students who aspire to academic research and teaching can benefit from a strong research faculty of international stature and exposure to practical applications of their specialties. Others seeking employment in industry, commerce, or government are afforded the opportunity to participate in high-quality applied research.

Admission Requirements

General Admission Requirements

Admission is competitive. Preference is given to applicants with strong credentials and appropriate undergraduate and/or professional preparation. Specific admission requirements for the program include:

- 1) A baccalaureate degree from a recognized institution. Students must show evidence of preparation in their chosen field sufficient to ensure profitable graduate study.
- 2) A satisfactory past academic performance as usually reflected by a grade point average of (or equivalent to) at least 3.0 (on a 4.0 scale) on courses related to the chosen field of Ph.D. study.
- 3) Excellent GRE or GMAT scores.
- 4) Applicants whose native language is not English must score at least 83 on the Internet-based version, 220 on the computer-based version, or 557 on the paper-based version of the Test of English as a Foreign Language (TOEFL). In addition, they will be required to take an English Proficiency Examination prior to the beginning of the first semester of study. Students who do not pass this examination must pass ENGL 1100 (English as a Foreign Language) with a grade of B or higher.
- 5) A one-page essay that addresses the following:
 - a) The applicant's motivation
 - b) Area(s) of research interest
- 6) Three letters of reference from professionals working in the applicant's field of interest that address the applicant's previous experience and potential to do research.

Further documentation that will support the application may include: evidence of scholarly and creative activity, including publication list; awards; results in national or international contests related to computing and information systems and the like.

Highly qualified individuals who may not meet all the required prerequisites may be admitted with a clear agreement to make up the prerequisites.

GRE/GMAT Waiver

The GRE or GMAT requirement may be waived for applicants if one of the following conditions is met:

- Applicant is a UNC Charlotte student or alumnus/a of the College of Computing and Informatics in undergraduate or graduate studies
- Applicant can provide evidence that they have worked in the computing or information technology industry in the U.S. for 5 or more years
- Applicant obtained an M.S. degree from a U.S.

institution accredited by an accepted accrediting body with a minimum GPA of 3.2 in a computing-based major such as:

- o Computer Science
- o Software and Information Systems
- o Computer Engineering
- o Electrical Engineering
- o Applied Mathematics
- o Statistics

Note: If an applicant receives GRE waiver, this is not an indication that they have been admitted to the Ph.D. program.

Concentration Specific Admission Requirements

Business Information Systems and Operations Management Concentration and Software and Information Systems Concentration

Additional admission requirements for the Business Information Systems and Operations Management concentration and Software and Information Systems concentration include:

- 1) Adequate understanding of software/information systems analysis, design, and implementation
- 2) Evidence of college-level skills in mathematical logic and data analysis (e.g., statistics, differential and integral calculus, discrete math, linear algebra)

Computer Science Concentration

Additional admission requirements for the Computer Science concentration include:

Coursework

Incoming students should possess a Master's or at least a Bachelor's degree in Computer Science, Computer Engineering, or a closely related discipline. Specifically, students should have demonstrable knowledge in at least four of the following areas:

- 1) Algorithms and Data Structures
- 2) Theory of Computation
- 3) Programming Language Concepts
- 4) Computer Architecture
- 5) Operating Systems
- 6) Software Engineering and Design

Course requirements may be satisfied through prior undergraduate or graduate work, or by a satisfactory score on the Computer Science Subject GRE examination. Admission into the Computer Science concentration is highly competitive. Thus, satisfying the requirements listed above does not guarantee admission.

Exceptionally strong students from other disciplines will be considered and may be allowed to make up the deficiencies at the discretion of the CS Ph.D. Admissions

Committee.

Research

Prior research experience and strong recommendation letters (preferably from university faculty or researchers at corporate labs) will be a significant consideration in evaluating the applicant's research potential. Research experience may be demonstrated via publications, Bachelor's or Master's theses. A good match with faculty research interests as well as faculty input to the Admissions Committee will play a significant role in the final decision. Potential applicants are encouraged to communicate with research faculty regarding their interests.

Advanced Standing Option Admission Requirements

To be admitted into the Advanced Standing Option for the CIS Ph.D. program, applicants must meet all the admission requirements of the Ph.D. stated above and must have earned a Master's degree in one of the following:

- Computer Science
- Software and Information Systems
- Computer Engineering

Only students who have earned a Master's degree in these areas will be considered, no exceptions will be made. All other students should apply to the CIS Ph.D. (without the Advanced Standing Option).

Application Deadlines

Application deadlines are in accordance with UNC Charlotte Graduate School deadlines. However, to ensure full consideration for financial support, applications must be received by September 1 for Spring admission and February 1 for Fall admission.

Degree Requirements (without Advanced Standing)

The Ph.D. in Computing and Information Systems program prepares students to be well-rounded professionals in the broad discipline of Computing and Information Systems (CIS). The degree of Doctor of Philosophy is granted for performance of original research resulting in significant contributions to the discipline's body of knowledge. Students are admitted into a concentration within the program by one of the participating units:

- 1) Department of Computer Science
- 2) Department of Software and Information Systems
- 3) Department of Bioinformatics and Genomics
- 4) Department of Business Information Systems and Operations Management

The Ph.D. in Computing and Information Systems program also has an interdisciplinary concentration in which CIS is applied to different disciplines. Students in the interdisciplinary concentration are admitted into one unit but are expected to complete some coursework in a complementary discipline in addition to the minimum core requirements of their chosen unit. Students in the interdisciplinary concentration must have co-advisors from their chosen unit and the complementary discipline. The detailed requirements are provided below. Failure to satisfy the requirements may result in the student's termination from the program.

To earn a Ph.D. degree, students in all concentrations must complete at least 72 post-baccalaureate credit hours. This includes at least 18 credit hours of dissertation research and at least 9 credit hours of coursework completed at UNC Charlotte. A limited amount of transfer credit is allowed (see below for details). Students are expected to acquire a sufficiently broad body of technical knowledge in the discipline as well as a deep understanding of a specialized area. Such courses will be defined by the student's advisor(s). Students are expected to excel in all coursework. Graduation requirements mandate that students must achieve a minimum grade point average of 3.0 to graduate. Receiving more than two C grades or a grade of U in any course will result in a suspension from the program.

Introductory Course (3 credit hours)

ITSC 8110 Introduction to Computing and Information Systems Research (3)

First-year students must take this introductory course in the first Fall semester. It is jointly taught by CIS Ph.D. faculty for all concentrations, providing new students an overview of the CIS research areas and opportunities at UNC Charlotte.

Only when there is an unavoidable schedule conflict between ITSC 8110 and another Ph.D. level course that a student has to take, can the student make a request to take ITSC 8110 in the second Fall semester. Such a request must be justified and signed by the student's initial Ph.D. advisor and endorsed by the Ph.D. Program Director.

Graduate Research Seminar (minimum 3 credit hours)

ITSC 8699 Graduate Research Seminar (1)

Students must sign up for and receive credit for ITSC 8699 every semester that they are in the Ph.D. program until they are admitted to Ph.D. candidacy.

If there is a legitimate reason that a student has to do part of their Ph.D. research in a different site during a regular semester, then they must first make a request to be exempted from taking ITSC 8699 for the period that they

are visiting the other site. Such a request must be well justified and signed by the student's Ph.D. advisor and endorsed by the Concentration Coordinator. The period of exemption should not exceed one semester. Exceptions must be approved by the Ph.D. Steering Committee.

Concentration Requirements

Bioinformatics Concentration

Required Courses (25 credit hours)

Students must take the following courses prior to the qualifying exam:

BINF 8100 - Biological Basis of Bioinformatics (3)
 BINF 8101 - Energy and Information in Biological Modeling (3)
 BINF 8111 - Bioinformatics Programming I (3)
 BINF 8112 - Bioinformatics Programming II (3)
 BINF 8200 - Statistics for Bioinformatics (3)
 BINF 8201 - Molecular Sequence Analysis (3)
 BINF 8202 - Computational Structural Biology (3)
 BINF 8911 - Bioinformatics Research Rotation I (2)
 BINF 8912 - Bioinformatics Research Rotation II (2)

Elective Courses (24 credit hours)

Select from the following:

BINF 8000-8999 - Bioinformatics Elective
 ITCS 8000-8999 - Computer Science Elective
 ITIS 8000-8999 - Software and Information Systems Elective
 ITSC 8000-8999 - Computing and Informatics Elective

Note: Students with exceptionally strong backgrounds in specific disciplines may be excused from one or more of the required didactic classes (except ITSC 8110) at the discretion of the Bioinformatics Concentration Coordinator.

Business Information Systems and Operations Management Concentration

In addition to the general CIS Ph.D. program requirements, students must also take:

Required Coursework (minimum 36 credit hours)

Take at least 36 credit hours of coursework approved by the student's Research Advisor(s). At least 9 credit hours of graduate coursework must be taken at UNC Charlotte. (Exceptions to minimum credit hour requirements may be granted by the Department's Graduate Affairs Committee upon the recommendation of the student's advisor. Such a request should only be granted based on overwhelming evidence that the student has excellent background knowledge to conduct high quality research in Computing and Information Systems.)

Dissertation Research (minimum 18 credit hours)

ITSC 8991 - Doctoral Dissertation Research (1 to 9)

Computer Science Concentration**Core Courses (12 credit hours)**

The GPA of these four core courses must be 3.5 or above. Core course requirements must be met within the first 30 credit hours of entering the program.

Group A (6 credit hours)

Select two of the following:

ITCS 8114 - Algorithms and Data Structures (3)

ITCS 8132 - Modeling and Analysis of Communication Networks (3)

ITCS 8156 - Machine Learning (3)

ITCS 8165 - Coding and Information Theory (3)

Group B (6 credit hours)

Select two of the following:

ITCS 8120 - Computer Graphics (3)

ITCS 8141 - Computer System and Architecture: Performance and Implementation (3)

ITCS 8150 - Artificial Intelligence (3)

ITCS 8160 - Database Systems (3)

ITCS 8166 - Computer Communications and Networks (3)

Elective Courses (30 credit hours)

With advisor approval, select from the following:

ITCS 8XXX - Computer Science Elective (3)

ITIS 8XXX - Software and Information Systems Elective (3)

ITSC 8XXX - Computing and Informatics Elective (3)
(excluding ITSC 8699, ITSC 8990, and ITSC 8991)

Pre-Dissertation Research (minimum 6 credit hours)

Students take during their first four semesters under the direction of one or more CIS Ph.D. Graduate Faculty members.

ITSC 8990 - Pre-Dissertation Research (1 to 6)

Dissertation Research (minimum 18 credit hours)

Take under the direction of one or more CIS Ph.D. Graduate Faculty members.

ITSC 8991 - Doctoral Dissertation Research (1 to 9)

Design Computation Concentration

The Design Computation concentration is an in-depth interdisciplinary program between the College of Computing and Informatics and the School of Architecture. The program is grounded in both critical theory and applied research, at the intersection of design, computation, and informatics, with two primary foci: (1) Computation as Design Inquiry and (2) Computation as Enabling Medium.

Computation as Design Inquiry investigates application of computing in design with research topics, including: computational methods, theories, and tools for design, fabrication, optimization, and construction automation; artificial intelligence, cognitive science, and computational theories in design.

Computation as Enabling Medium investigates the application of computing to enhance the human experience of the built environment. Research topics in this area include: intelligent systems, interfaces, and mechanisms for social consciousness, participation, and cooperation in building, urban, infrastructure, and mobility systems; computational modeling for urban resilience; and ethical questions that arise from human-in-the-loop synergies.

The curriculum balances technical rigor with theoretical foundations in an immersive project-based education and combines courses from Architecture, Computer Science, Software Information Systems, and Data Science. Applicants are expected to clearly articulate research topics during their application to their program. Admitted students should have co-advisors and members of their dissertation committees from the faculty of both the College of Arts + Architecture (CoA+A) and the College of Computing and Informatics (CCI).

Primary research topics include:

- Urban Resilience through Pervasive Computing
- Human Building Interaction
- Computational Design Manufacturing and Robotics

Core Courses (30 credit hours)

GRAD 8302 - Responsible Conduct of Research (2)

GRAD 8990 - Academic Integrity (0)

ITSC 8110 - Introduction to Computing and Information Systems Research (3)

ITSC 8699 - Graduate Research Seminar (1) (taken every semester until proposal; 3+ credit hours)

ITSC 8990 - Pre-Dissertation Research (1 to 6) (taken for 6+ credit hours)

ITSC 8991 - Doctoral Dissertation Research (1 to 9) (taken for 18+ credit hours)

Design Computation Concentration Core Courses (19 credit hours)

ARCH 8004 - Architectural History Topics (3) (*Design Computation Theory*)

ARCH 7211 - Studio Lab I (4 to 6)

or ARCH 8211 - Studio Lab (4)

or ARCH 7212 - Studio Lab II (4 to 6)

Architecture Course (3 credit hours)

Select one of the following:

ARCH 8050 - Architectural Elective: Connective Environments I (3)

ARCH 8607 - Digital Manufacturing and Robotics (3)

Software and Information Systems Course (3 credit hours)

Select one of the following:

ITIS 5166 - Backend Application Development (3)
 ITIS 5180 - Mobile Application Development (3)
 ITIS 8300 - Human-Centered Design (3)
 ITIS 8326 - Network Science (3)

Computer Science Course (3 credit hours)

Select one of the following:

ITCS 8124 - Illustrative Visualization (3)
 ITCS 8125 - Virtual and Augmented Reality (3)
 ITCS 8162 - Data Mining (3)

Data Science Course (3 credit hours)

Select one of the following:

DSBA 6100 - Big Data Analytics for Competitive Advantage (3)
 DSBA 6156 - Applied Machine Learning (3)

Design Computation Concentration Elective Courses (23 credit hours)

Select from ITCS, ITIS, ARCH, or DSBA courses.

Software and Information Systems Concentration Core Courses (9 credit hours)

A GPA of 3.6 or above is required for these courses. Advanced versions of the core courses can be used as substitutes upon permission from both the student's academic advisor and the program coordinator. Core course requirements must be met during the first 30 credit hours within the program.

Select three of the following:

ITIS 8180 - Foundations of Health Informatics (3)
 ITIS 8200 - Principles of Information Security and Privacy (3)
 ITIS 8300 - Human-Centered Design (3)
 ITIS 8326 - Network Science (3)

Elective Courses (30 credit hours)

With advisor approval, select from the following:

ITCS 8XXX - Computer Science Elective (3)
 ITIS 8XXX - Software and Information Systems Elective (3)
 ITSC 8XXX - Computing and Informatics Elective (3)
 (excluding ITSC 8699, ITSC 8990, and ITSC 8991)

Pre-Dissertation Research (minimum 6 credit hours)

Students take during their first four semesters under the direction of one or more CIS Ph.D. Graduate Faculty members.

ITSC 8990 - Pre-Dissertation Research (1 to 6)

Dissertation Research (minimum 18 credit hours)

Take under the direction of one or more CIS Ph.D. Graduate Faculty members.

ITSC 8991 - Doctoral Dissertation Research (1 to 9)

Interdisciplinary Concentration

The coursework requirements of this concentration depend on the chosen unit and complementary discipline. Students in this concentration must select Computer Science (CS) or Software and Information Systems (SIS) as their home unit. The core courses of that unit apply to them.

Computer Science Core Courses (12 credit hours)

Group A (6 credit hours)

Select two of the following:

ITCS 8114 - Algorithms and Data Structures (3)
 ITCS 8132 - Modeling and Analysis of Communication Networks (3)
 ITCS 8156 - Machine Learning (3)
 ITCS 8165 - Coding and Information Theory (3)

Group B (6 credit hours)

Select two of the following:

ITCS 8120 - Computer Graphics (3)
 ITCS 8141 - Computer System and Architecture: Performance and Implementation (3)
 ITCS 8150 - Artificial Intelligence (3)
 ITCS 8160 - Database Systems (3)
 ITCS 8166 - Computer Communications and Networks (3)

Software and Information Systems Core Courses (9 credit hours)

Select three of the following:

ITIS 8180 - Foundations of Health Informatics (3)
 ITIS 8200 - Principles of Information Security and Privacy (3)
 ITIS 8300 - Human-Centered Design (3)
 ITIS 8326 - Network Science (3)

Elective Discipline Courses

Beyond the core requirements of the chosen unit, students must select a minimum of two graduate courses from a complementary discipline with the approval of their advisors.

Degree Total = 72 Credit Hours

Degree Requirements (with Advanced Standing Option)

Students with a Master's degree in Computer Science, Software and Information Systems, or Computer Engineering may be accepted into the Advanced Standing Option for the CIS Ph.D. under the Concentrations in Computer Science or Software and Information Systems.

The degree requirements for the Advanced Standing Option are similar to the CIS Ph.D., except that students must complete only 42 credit hours. No transfer credit is allowed under this program.

Introductory Course (3 credit hours)

ITSC 8110 - Introduction to Computing and Information Systems Research (3)

Graduate Research Seminar (minimum 3 credit hours)

ITSC 8699 - Graduate Research Seminar (1)

Dissertation Research (minimum 18 credit hours)

ITSC 8991 - Doctoral Dissertation Research (1 to 9)

Concentration Core Courses (6 credit hours)

Computer Science Concentration

Group A

Select one of the following:

ITCS 8114 - Algorithms and Data Structures (3)

ITCS 8132 - Modeling and Analysis of Communication Networks (3)

ITCS 8156 - Machine Learning (3)

ITCS 8165 - Coding and Information Theory (3)

Group B

Select one of the following:

ITCS 8120 - Computer Graphics (3)

ITCS 8141 - Computer System and Architecture: Performance and Implementation (3)

ITCS 8150 - Artificial Intelligence (3)

ITCS 8160 - Database Systems (3)

ITCS 8166 - Computer Communications and Networks (3)

Software and Information Systems Concentration

Select two of the following:

ITIS 8180 - Foundations of Health Informatics (3)

ITIS 8200 - Principles of Information Security and Privacy (3)

ITIS 8300 - Human-Centered Design (3)

ITIS 8326 - Network Science (3)

Concentration Elective Courses (6 credit hours)

Select two of the following:

ITCS 8XXX - Computer Science Elective (3)

ITIS 8XXX - Software and Information Systems Elective (3)

ITSC 8XXX - Computing and Informatics Elective (3)
(excluding ITSC 8699, ITSC 8990, and ITSC 8991)

Additional Elective Courses (minimum 6 credit hours)

A minimum of 42 credit hours are required to complete the degree. Once the above course requirements have been met, the remaining credit hours can be satisfied via coursework, pre-dissertation research (up to 6 credit hours of ITSC 8990), or research credit hours (ITSC 8991).

Degree Total = 42 Credit Hours

Research Advisor(s) and Qualifying Exam Committee

Each Ph.D. student is assigned a temporary academic advisor(s) within a concentration when admitted to the program. Before the end of their fourth semester in the program, students should select a Research Advisor(s) and, in consultation with their Research Advisor(s), form a Qualifying Exam Committee. The Qualifying Exam Committee should include at least three CIS Doctoral Faculty members, plus the student's the Research Advisor who is a non-voting member of the Qualifying Exam Committee. The Qualifying Exam Committee must be approved by the Concentration Coordinator.

Qualifying Examination

Each student must pass a Qualifying Examination, given and evaluated by the student's Qualifying Exam Committee. The purpose of the Qualifying Exam is to ensure that the student will have sufficient capability for doing dissertation-level research leading to a Ph.D. degree.

Each student must prepare a written research survey that describes the research area the student is expected to do their dissertation research in. Copies of the research survey must be provided to the committee at the time of filing the Qualifying Examination application, which must be at least two weeks prior to the exam. Each student must present their research survey and defend it in a manner accepted by the Qualifying Exam Committee. Prior to the oral defense of the research survey, the student's advisor is required to submit a written evaluation of the student's research and academic progress to the Qualifying Exam Committee, with a copy also provided to the Concentration Coordinator. The Qualifying Exam is graded on a Pass/Unsatisfactory basis, based on the corresponding rubrics by the Qualifying Exam Committee. A pass decision must be unanimous.

Students must pass the Qualifying Examination in at most two attempts within three years of the date of first enrollment into Ph.D. study at UNC Charlotte. Students in the Advanced Standing Option must take the Qualifying Examination before the end of their first year in the doctoral program. A student who fails the Qualifying Exam twice will be terminated from the Ph.D. in Computing and Information Systems program.

Dissertation Committee

After passing the qualifying exam, the student should set up a Dissertation Committee of at least four graduate faculty members, which include at least three Ph.D. in Computing and Information Systems faculty members. This Committee may, but is not required to, consist of the same faculty members as the Qualifying Exam Committee. Ordinarily, the chair of this committee will be the student's advisor(s), who must be a member of the CIS Ph.D. program faculty and will ensure that the composition of the committee is appropriate. Committee members from outside the University must be appointed Associate Graduate Faculty members at UNC Charlotte. The Dissertation Committee must be approved by the Concentration Coordinator. After identifying and obtaining the signatures of the CIS faculty who will be serving on the Committee, the Dissertation Committee Form must be sent to the Graduate School for the appointment of the Graduate Faculty Representative. This appointment may take as long as four weeks. If there is need to change committee members later, a formal written request must be first submitted to the CIS Ph.D. Steering Committee with a clear explanation of the rationale for change. Upon approval by the CIS Ph.D. Steering Committee, a revised Committee form (above) must be submitted.

Proposal Defense

Each student must present and defend a Ph.D. dissertation proposal after passing the qualifying exam and within ten semesters since entering the Ph.D. program. The proposal defense will be conducted by the student's Dissertation Committee and will be open to the CIS Ph.D. faculty and students. The student shall provide copies of the written proposal to the Committee members at least two weeks before the scheduled defense. At the discretion of the Dissertation Committee, the defense may include questions that cover the student's program of study and background knowledge in the area of the proposal. The proposal defense will be graded on a Pass/Unsatisfactory basis, according to the corresponding rubrics by the Committee. A pass must be a unanimous decision by the Committee members; otherwise, the proposal defense fails. A student may retake the proposal defense if they cannot pass it the first time, and should consult the Concentration Coordinator before the second attempt. The second failed defense of a dissertation proposal will result in the termination of the student's enrollment in the Ph.D. program. It is expected that the student first takes the proposal defense by the ninth semester after they are enrolled, in order to provide time for a second attempt should the first one fail.

Ph.D. Candidacy

A doctoral student advances to Ph.D. candidacy after the dissertation proposal has been successfully defended.

Dissertation

Each student must complete a research program approved by the student's Dissertation Advisor(s) that yields a high quality, original, and substantial piece of research. The Ph.D. dissertation describes this research and its results. The dissertation defense is a public presentation. A written copy of the dissertation must be made available to each member of the student Ph.D. Dissertation Committee, to the Ph.D. Steering Committee, and to the UNC Charlotte Library, at least three weeks before the public defense. The date of the defense must be publicly announced at least three weeks prior to the defense. The student must present the dissertation and defend it in a manner accepted by the Dissertation Committee. The dissertation will be graded on a Pass/Unsatisfactory basis, based on the corresponding rubrics by the Dissertation Committee. A pass decision must be unanimous and must be approved by the Dean of the Graduate School. A student who fails the defense of a dissertation twice will be terminated from the Ph.D. in Computing and Information Systems program.

Progress Report and Evaluation

By every January, each student is required to submit a written progress report for the previous year, and the advisor(s) is required to submit a written evaluation of the student to the Concentration Coordinator, with a copy to the Program Director. A rubric is used for evaluation of progress. Failure to make satisfactory progress may result in discontinuation of the student's graduate assistantship and suspension from the program.

Residency Requirements

Each student must satisfy the residency requirement of one continuous full-time year (i.e., two consecutive semesters with the student being enrolled for at least nine graduate credit hours in each semester) after being admitted to the Ph.D. degree program.

Transfer Credit

In accordance with rules of the UNC Charlotte Graduate School, students are allowed to transfer up to 30 credit hours of graduate credit earned at UNC Charlotte or other recognized graduate programs. In cases of applicants with records of exceptionally high quality, the CIS Ph.D. Steering Committee, at its discretion, may request that the Graduate School approve transfer credit beyond the limit set by the Graduate School. To receive transfer credit, students must file a written request and submit all necessary documents to the Concentration Coordinator.

Note: Transfer credit is not accepted under the Advanced Standing Option.

SOFTWARE AND INFORMATION SYSTEMS

- M.S. in Cybersecurity
- M.S. in Information Technology
 - Advanced Data and Knowledge Discovery
 - Emerging Technologies
 - Human-Centered Design
 - Information Security and Privacy
 - Information Technology Management
 - Software Systems Design and Engineering
 - Web Development
- Master of Architecture and M.S. in Computer Science or Information Technology Dual Degree *(see under Architecture in the "College of Arts + Architecture" section)*
- Graduate Certificate in Health Informatics and Analytics *(see under Health Informatics)*
- Graduate Certificate in Information Security and Privacy
- Graduate Certificate in Management of Information Technology
- Graduate Certificate in Software Development

Department of Software and Information Systems

sis.charlotte.edu

M.S. in Cybersecurity

The Master of Science in Cybersecurity is designed to equip students with the latest knowledge and skills in cybersecurity and privacy. Graduates of the program are employable by both businesses and governments that have important information assets to be protected from increasingly sophisticated cyber-attacks.

Specific educational objectives of the program include:

- A fundamental understanding of:
 - common vulnerabilities of computing and networked systems,
 - cyber-attacking methods,
 - human and organizational aspects of cybersecurity,
 - methods for compromising privacy, and
 - risk assessment of cyber-attacks.
- Able to apply security techniques to analyze and evaluate the security risk of information systems and networks.
- Able to design information systems and networks with security controls to minimize security risks.

The program requires students to take four core courses and six elective courses. The core courses are designed to prepare students with fundamental knowledge and skills in cybersecurity and privacy protection that are essential to all cybersecurity professionals. The elective courses give students an opportunity to broaden their knowledge and skills in major areas of cybersecurity. Together, these two components equip students with necessary skill sets in specific areas in cybersecurity and privacy where they wish to pursue their professional careers.

Students entering the Master of Science in Cybersecurity program are required to have completed a baccalaureate degree from a college or university accredited by an accepted accrediting body and have acquired substantial experience in studying, applying, or developing information and computing technology. Such experience may be developed by completing an undergraduate major in a discipline related to information technology, including but not limited to: business information systems, computer engineering, computer science, data communication, information management, information technology, mathematical and physical sciences, and software engineering. For applicants who have an undergraduate major not directly related to computing, the experience may be acquired through work, professional training, or further education such as graduate certificates or post baccalaureate studies.

Admission Requirements

Admission requirements specific to the program include:

- Undergraduate or equivalent coursework in (a) data structures, (b) object-oriented programming in C++, C#, or java, (c) databases, (d) computer networks and (e) web application development, all with minimum GPAs of 3.0 on a 4.0 scale. Applicants who have substantial work experience in applying or developing computing and information technology may be able to substitute their work experience for the above specific requirements, subject to review by the Graduate Program Director.
- Undergraduate GPA or equivalent of at least 3.0 on a 4.0 scale, and a Junior/Senior GPA of at least 3.0
- Satisfactory score on the aptitude portion of the Graduate Record Examination (GRE) or the Graduate Management Admission Test (GMAT). The GRE/GMAT requirement will be waived for applicants

who: 1) Have a cumulative undergraduate or graduate GPA of 3.0 and above from a college or university accredited by an accepted accrediting body, 2) Are currently enrolled in an undergraduate or graduate program at UNC Charlotte, and have completed at least 3 courses successfully with a GPA of 3.2 or better, or 3) Have a minimum of five years of relevant work experience in information technology or related fields in the United States.

- Statement of purpose
- Letters of recommendation

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

Students are required to complete 30 credit hours for the M.S. in Cybersecurity degree program, of which: (a) 12 are for 4 common core courses, (b) 15 are for 5 elective courses in cybersecurity, and (c) 3 are for one elective course in computing and information technology.

Core Courses (12 credit hours)

ITIS 5250 - Computer Forensics (3)
 ITIS 6167 - Network Security (3)
 ITIS 6200 - Principles of Information Security and Privacy (3)
 ITIS 6240 - Applied Cryptography (3)

Elective Courses (18 credit hours)

3 of the 18 required elective credit hours may be substituted by an approved IT Internship, which also serves as a capstone project.

Cybersecurity Elective Courses (15 credit hours)

Select five of the following.

ITIS 5221 - Secure Programming and Penetration Testing (3)
 ITIS 5246 - Competitive Cyber Defense (3)
 ITIS 5260 - Introduction to Security Analytics (3)
 ITIS 5331 - Web-Based Mobile and IoT Firmware Security (3)
 ITIS 6150 - Software Assurance (3)
 ITIS 6210 - Access Control and Security Architecture (3)
 ITIS 6214 - Usable Security and Privacy (3)
 ITIS 6220 - Data Privacy (3)
 ITIS 6230 - Enterprise and Infrastructure Protection (3)
 ITIS 6260 - Quantum Computing (3)
 ITIS 6270 - Blockchain, Cryptocurrency, and Distributed Ledger Technologies (3)
 ITIS 6268 - Wireless Network Security (3)

ITIS 6320 - Cloud Data Storage (3)

ITIS 6330 - Malware Analysis (3)

ITIS 6362 - Information Technology Ethics, Policy, and Security (3)

ITIS 6880 - Individual Study (1 to 3) (*independent study for a security topic may be repeated, but only 3 credit hours may count towards the degree*)

ITIS 6999 - SFS Research (3) (*may be repeated, but only 3 credit hours may count towards the degree*)

College of Computing and Informatics Elective Course (3 credit hours)

Select any additional graduate course offered by the College of Computing and Informatics.

Capstone Experience

Select one of the following three options to complete the 30-credit hour program:

Coursework + Master's Thesis

24 credit hours of coursework plus 6 credit hours of Master's research thesis project. The thesis option requires the formation of a program committee. The thesis option requires students to perform research under the supervision of an academic advisor, submit a written thesis, and orally defend their work before their program committee.

Coursework + Internship

27 credit hours of coursework plus 3 credit hours of an approved IT Internship. The internship option requires approval by the program director of an internship location and preceptor, and the submission of a written internship report.

Coursework + Project Report

30 credit hours of coursework plus a project report. The project report option requires completion of 30 credit hours of coursework and successfully completing a report describing a project experience in cybersecurity to fulfill the requirements of a culminating experience for the M.S. degree. The report is submitted to and approved by the Graduate Program Director.

Degree Total = 30 Credit Hours

Grade Requirements

Students in the M.S. in Cybersecurity program must maintain a minimum GPA of 3.0 for continued enrollment in the program. Accumulation of three C grades results in suspension from the program. Accumulation of one unsatisfactory (U) grade results in suspension from the program.

M.S. in Information Technology

The Master of Science in Information Technology (MSIT) program is designed to equip students with advanced skills and knowledge in the planning, design, implementation, testing and evaluation, deployment, maintenance, and management of applications and systems that embody information and communication technologies for their proper functioning. These skills form necessary foundations for solving practical problems that arise in business, industrial, governmental, and other organizations, as well as for pursuing doctoral studies in information technologies.

The current areas of concentration include: Advanced Data and Knowledge Discovery, Emerging Technologies, Human-Centered Design, Information Security and Privacy, Information Technology Management, Software Systems Design and Engineering, and Web Development.

Students entering the MSIT program are required to have completed a baccalaureate degree from a college or university accredited by an accepted accrediting body and have acquired substantial experience in studying, applying, or developing information and computing technology. Such experience may be developed by completing an undergraduate major in a discipline related to information technology, including but not limited to, business information systems, computer engineering, computer science, data communication, information management, information technology, mathematical and physical sciences, and software engineering. For applicants who have an undergraduate major not directly related to computing, the experience may be acquired through work, professional training, or further education such as post baccalaureate studies.

Admission Requirements

Admission requirements specific to the MSIT program include:

- 1) Applicants must have completed undergraduate or equivalent coursework in (a) data structures and (b) object-oriented programming in C++, C#, or Java, both with a minimum GPAs of 3.0 on a 4.0 scale. Applicants who have substantial work experience in applying or developing computing and information technology may be able to substitute their work experience for the specific requirements for object-oriented programming and/or data structures, subject to review by the MSIT Program Coordinator.
- 2) All applicants must have an undergraduate GPA or equivalent of at least 3.0 on a scale of 1.0 to 4.0, and a Junior/Senior GPA of at least 3.0.
- 3) Applicants are required to demonstrate a satisfactory score on the aptitude portion of the Graduate Record

Examination (GRE) or the Graduate Management Admission Test (GMAT). UNC Charlotte students with a GPA of 3.0 or above who have completed or are enrolled in a bachelor's degree or graduate certificate program may request a waiver of the GRE or GMAT exams, subject to approval of the Graduate Program Director.

GRE/GMAT Waiver

The GRE/GMAT requirement will be waived for applicants who: (1) Have a cumulative undergraduate or graduate GPA of 3.0 and above from a college or university accredited by an accepted accrediting body; (2) Are currently enrolled in an undergraduate or graduate program at UNC Charlotte, and have completed at least 3 courses successfully with a minimum GPA of 3.2; or (3) Have a minimum of five years of relevant work experience in information technology or related fields in the United States.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Master of Science in Information Technology degree requires a total of 30 graduate credit hours with a minimum GPA of 3.0, together with a capstone or culminating experience. Additionally, the following requirements must be met:

- No more than 12 credit hours of coursework may be taken from outside of the courses offered by the Department of Software and Information Systems
- At least 15 credit hours must be taken from 6000 level or above courses
- No more than 3 credit hours may be taken for Individual Study
- A maximum of 6 graduate credit hours may be transferred from other institutions

The 30 credit hours of coursework comprise the following three parts:

Core Courses (15 credit hours)

Advanced Programming Courses

Select one of the following:

ITIS 5166 - Backend Application Development (3)

ITIS 5180 - Mobile Application Development (3)

Software Systems Courses

Select one of the following:

- ITIS 6112 - Software System Design and Implementation (3)
- ITIS 6177 - System Integration (3)
- ITIS 6342 - Information Technology Project Management (3)

Databases and Data Science Courses

Select one of the following:

- ITIS 6120 - Applied Databases (3)
- ITIS 6162 - Knowledge Discovery in Databases (3)

Principles Courses

- ITIS 6200 - Principles of Information Security and Privacy (3)
- ITIS 6400 - Human-Centered Design (3)

Concentration Courses (9 credit hours)

The MSIT program offers the following concentrations:

- 1) Advanced Data and Knowledge Discovery
- 2) Emerging Technologies
- 3) Human-Centered Design
- 4) Information Security and Privacy
- 5) Information Technology Management
- 6) Software Systems Design and Engineering
- 7) Web Development

Each student is required to select one concentration and complete 3 courses selected from the list of approved courses for the specific concentration. Among the 9 credit hours for a concentration, 6 may be substituted with a master's research thesis. The topic for the research thesis must fall within the area of concentration. A core course cannot be double-counted toward a concentration. Subject to the approval of the MSIT Program Director, a course from outside of the approved list for a concentration may be taken as a substitute for a course for the concentration.

Advanced Data and Knowledge Discovery Concentration

Select three of the following:

- ITCS 5122 - Visual Analytics (3)
- ITCS 6100 - Big Data Analytics for Competitive Advantage (3)
or DSBA 6100 - Big Data Analytics for Competitive Advantage (3)
- ITCS 6155 - Knowledge-Based Systems (3)
- ITCS 6156 - Machine Learning (3)
- ITCS 6157 - Visual Databases (3)
- ITCS 6161 - Advanced Topics in Database Systems (3)
- ITCS 6190 - Cloud Computing for Data Analysis (3)
- ITCS 6265 - Advanced Topics in Data Mining (3)
- ITIS 5310 - Web Mining (3)
- ITIS 6010 - Topics in Software and Information Systems (3)
(only if topic is applicable and approved by program director)

- or ITCS 6010 - Topics in Computer Science (3) *(only if topic is applicable and approved by program director)*
- ITIS 6150 - Software Assurance (3)
- ITIS 6162 - Knowledge Discovery in Databases (3)
- ITIS 6163 - Data Warehousing (3)
or ITCS 6163 - Data Warehousing (3)
- ITIS 6220 - Data Privacy (3)
- ITIS 6318 - Personalization and Recommender Systems (3)
- ITIS 6320 - Cloud Data Storage (3)
- ITIS 6326 - Network Science (3)
- ITIS 6362 - Information Technology Ethics, Policy, and Security (3)
- MBAD 6201 - Business Intelligence and Analytics (3)
or DSBA 6201 - Business Intelligence and Analytics (3)
- MBAD 6211 - Advanced Business Analytics (3)

Emerging Technologies Concentration

Select three courses from the aggregated list of courses for all the other concentrations. Students are recommended to select each course from a different concentration to maximize their exposure to the broadest range of latest knowledge in computing and information technology.

Human-Centered Design Concentration

- ITIS 5350 - Design Prototyping (3)
- ITIS 5390 - Interaction Design Projects (3)

Elective Courses

Select one course from the following list:

- ARCH 7211 - Studio Lab I (4 to 6)
- ARCH 7212 - Studio Lab II (4 to 6)
- ITIS 6010 - Topics in Software and Information Systems (3)
(only if topic is applicable and approved by program director)
or ITCS 6010 - Topics in Computer Science (3) *(only if topic is applicable and approved by program director)*
- PSYC 6116 - Cognition (3)
- ITIS 5353 - Social Technology Design (3)
- ITIS 5355 - Accessible Design and Implementation (3)
- ITIS 5358 - Physical Computing (3)
- ITIS 5360 - Human-Centered AI (3)
- ITIS 6214 - Usable Security and Privacy (3)
- ITIS 6318 - Personalization and Recommender Systems (3)
- PSYC 6216 - Introduction to Cognitive Science (3)

Information Security and Privacy Concentration

Select three of the following:

- ITIS 5221 - Secure Programming and Penetration Testing (3)
- ITIS 5246 - Competitive Cyber Defense (3)
- ITIS 5250 - Computer Forensics (3)
- ITIS 5260 - Introduction to Security Analytics (3)
- ITIS 5331 - Web-Based Mobile and IoT Firmware Security (3)
- ITIS 6010 - Topics in Software and Information Systems (3)
(only if topic is applicable and approved by program director)

director)

or ITCS 6010 - Topics in Computer Science (3) *(only if topic applicable and approved by program director)*

ITIS 6150 - Software Assurance (3)

ITIS 6167 - Network Security (3)

ITIS 6210 - Access Control and Security Architecture (3)

ITIS 6214 - Usable Security and Privacy (3)

ITIS 6220 - Data Privacy (3)

ITIS 6230 - Enterprise and Infrastructure Protection (3)

ITIS 6240 - Applied Cryptography (3)

ITIS 6260 - Quantum Computing (3)

ITIS 6268 - Wireless Network Security (3)

ITIS 6320 - Cloud Data Storage (3)

ITIS 6330 - Malware Analysis (3)

ITIS 6362 - Information Technology Ethics, Policy, and Security (3)

Information Technology Management Concentration

ITIS 6342 - Information Technology Project Management (3) *(if not already taken as a Core Course)*

ITIS 6362 - Information Technology Ethics, Policy, and Security (3)

Plus 1-2 of the following, to result in 3 courses for this concentration:

ITCS 5161 - Intellectual Property Aspects of Computing (3)

ITIS 6010 - Topics in Software and Information Systems (3) *(only if topic applicable and approved by program director)*

or ITCS 6010 - Topics in Computer Science (3) *(only if topic applicable and approved by program director)*

ITIS 6177 - System Integration (3)

ITIS 6230 - Enterprise and Infrastructure Protection (3)

ITIS 6320 - Cloud Data Storage (3)

MBAD 6122 - Decision Modeling and Analysis via Spreadsheets (3)

MBAD 6141 - Operations Management (3)

MBAD 6161 - Human Behavior in Organizations (3)

MBAD 6164 - Executive Communication (3)

MBAD 6165 - Negotiation and Conflict Management (3)

MBAD 6201 - Business Intelligence and Analytics (3)

or DSBA 6201 - Business Intelligence and Analytics (3)

MBAD 6202 - Managing IT-Enabled Business Processes and Systems (3)

MBAD 6207 - Business Project Management (3)

Software Systems Design and Engineering Concentration

ITIS 6112 - Software System Design and Implementation (3) *(if not already taken as a Core Course)*

Plus 2-3 of the following, to result in 3 courses for this concentration:

ITIS 5166 - Backend Application Development (3)

ITIS 5180 - Mobile Application Development (3)

ITIS 5221 - Secure Programming and Penetration Testing (3)

ITIS 5280 - Advanced Mobile Application Development (3)

ITIS 5390 - Interaction Design Projects (3)

ITIS 6010 - Topics in Software and Information Systems (3) *(only if topic applicable and approved by program director)*

or ITCS 6010 - Topics in Computer Science (3) *(only if topic applicable and approved by program director)*

ITIS 6150 - Software Assurance (3)

ITIS 6177 - System Integration (3)

ITIS 6210 - Access Control and Security Architecture (3)

ITIS 6260 - Quantum Computing (3)

ITIS 6362 - Information Technology Ethics, Policy, and Security (3)

Web Development Concentration

Select three of the following:

ITIS 5166 - Backend Application Development (3)

ITIS 5180 - Mobile Application Development (3)

ITIS 5221 - Secure Programming and Penetration Testing (3)

ITIS 5310 - Web Mining (3)

ITIS 5350 - Design Prototyping (3)

ITIS 5390 - Interaction Design Projects (3)

ITIS 6010 - Topics in Software and Information Systems (3) *(only if topic applicable and approved by program director)*

or ITCS 6010 - Topics in Computer Science (3) *(only if topic applicable and approved by program director)*

ITIS 6177 - System Integration (3)

ITIS 6318 - Personalization and Recommender Systems (3)

ITIS 6326 - Network Science (3)

ITIS 6362 - Information Technology Ethics, Policy, and Security (3)

Elective Courses (6 credit hours)

Students fulfill the remaining requirements for coursework by completing two approved elective courses from the College of Computing and Informatics.

Part of the elective requirements may also be met by taking the following internship:

ITIS 6498 - IT Internship Project (3)

Culminating Experience (0-6 credit hours)

All students must successfully complete a culminating experience. This requirement is satisfied by completing any one of the following three:

- **IT Project:** a 15-page written report on knowledge related to one or more courses or a programming experience (0 credit hours)
- **IT Internship:** ITIS 6498 - IT Internship Project (3)
- **IT Master's Thesis:** ITIS 6991 - Information Technology Thesis (6 credit hours; taken for 2 semesters)

Degree Total = 30 Credit Hours

Graduate Certificate in Human-Computer Interaction

The Graduate Certificate in Human Computer Interaction provides both knowledge and skills in the human-centered design of interfaces for software applications. Students are provided with a basic understanding of human-centered design methods, as well as practical experience with techniques for designing, prototyping, implementing, and evaluating user interfaces.

The certificate is awarded upon completion of four graduate level courses (12 credit hours) in the area of human-computer interaction and design. Requests for related course substitutions may be approved at the discretion of the Graduate Program Director.

The graduate certificate may act as a standalone graduate option for post-baccalaureate and post-master's students, or may be pursued concurrently with a related graduate degree program at UNC Charlotte. The 12 credit hours in the certificate program may be applied to the graduate programs in the Department of Software and Information Systems with approval of the department Graduate Program Director.

All requirements must be completed within five years of studies, starting from the time when the first course for the certificate is taken. Coursework taken for one graduate certificate may not be counted towards a second graduate certificate.

Admission Requirements

This graduate certificate program is open to all applicants who hold a bachelor's degree from a college or university accredited by an accepted accrediting body, with a minimum overall GPA of 2.8 on a 4.0 scale. The requirements on GPA may be waived if an applicant is currently enrolled and in good standing in a graduate degree program at UNC Charlotte. Applicants should also have either a degree in or minimum one year of work experience in computing, digital communication, design, web development, or other related areas.

Certificate Requirements

Core Courses (6 credit hours)

ITIS 5390 - Interaction Design Projects (3)
ITIS 6400 - Human-Centered Design (3)

Elective Courses (6 credit hours)

Select two of the following:

ITIS 5350 - Design Prototyping (3)
ITIS 6214 - Usable Security and Privacy (3)

ITCS 5121 - Information Visualization (3)

ITCS 5122 - Visual Analytics (3)

Certificate Total = 12 Credit Hours

Grade Requirements

The cumulative GPA for the courses in the program must be a minimum of 3.0.

Graduate Certificate in Information Security and Privacy

The Graduate Certificate in Information Security and Privacy provides professionals with an opportunity to advance their level of competence in the understanding, management, and applications of cybersecurity and privacy technology. Coursework towards this graduate certificate can be used for credit towards the M.S. in Information Technology or M.S. in Cybersecurity. However, its primary objective is to provide a well-defined target for students who want to advance their knowledge and skills in understanding and applying cybersecurity technology, but do not necessarily wish to complete all the requirements for a Master's degree. The certificate may be pursued concurrently with any of the graduate degree programs at UNC Charlotte.

Admission Requirements

This graduate certificate program is open to all applicants who hold a bachelor's degree from a college or university accredited by an accepted accrediting body in a computing, mathematical, engineering or business discipline, with a minimum overall GPA of 2.8 and Junior/Senior GPA of 3.0, on a 4.0 scale. In addition, applicants are required to have substantial knowledge of data structures and object-oriented programming in C++, C# or Java.

The requirements on GPA may be waived if an applicant is currently enrolled and in good standing in a graduate degree program at UNC Charlotte.

As part of an application for the graduate certificate program, applicants are required to submit a brief (one-to-two page) statement of educational and work experience in applying information technology. All applications are handled centrally through the Office of Graduate Admissions. *Note: the admission process for the graduate certificate is separate from the admission process for a M.S. degree.*

Certificate Requirements

The Certificate requires 12 credit hours of coursework. All requirements must be completed within five years of studies, starting from the time when the first course for the

certificate is taken. Coursework taken for one graduate certificate may not be counted towards a second graduate certificate.

Core Course (3 credit hours)

ITIS 6200 - Principles of Information Security and Privacy (3)

Elective Courses (9 credit hours)

Select three of the following:

ITIS 5221 - Secure Programming and Penetration Testing (3)

ITIS 5246 - Competitive Cyber Defense (3)

ITIS 5250 - Computer Forensics (3)

ITIS 5260 - Introduction to Security Analytics (3)

ITIS 5331 - Web-Based Mobile and IoT Firmware Security (3)

ITIS 6150 - Software Assurance (3)

ITIS 6167 - Network Security (3)

ITIS 6210 - Access Control and Security Architecture (3)

ITIS 6214 - Usable Security and Privacy (3)

ITIS 6220 - Data Privacy (3)

ITIS 6230 - Enterprise and Infrastructure Protection (3)

ITIS 6240 - Applied Cryptography (3)

ITIS 6260 - Quantum Computing (3)

ITIS 6268 - Wireless Network Security (3)

ITIS 6320 - Cloud Data Storage (3)

ITIS 6330 - Malware Analysis (3)

ITIS 6362 - Information Technology Ethics, Policy, and Security (3)

ITIS 6498 - IT Internship Project (3)

Certificate Total = 12 Credit Hours

Graduate Certificate in Management of Information Technology

The Graduate Certificate in Management of Information Technology provides professionals with an opportunity to advance their level of competence in the management and applications of computing and information technology through formal training. Coursework towards this graduate certificate can be used for credit towards the M.S. in Information Technology. However, its primary objective is to provide a well-defined target for students who want to advance their knowledge and skills in applying and managing information technology, but do not necessarily wish to complete all the requirements for the M.S. in Information Technology. The certificate may be pursued concurrently with any of the graduate degree programs at UNC Charlotte.

Admission Requirements

This graduate certificate program is open to all applicants who hold a bachelor's degree from a college or university

accredited by an accepted accrediting body with a minimum overall GPA of 2.8 and Junior/Senior GPA of 3.0, on a 4.0 scale. In addition, applicants are expected to have substantial working knowledge of applications of information technology.

The requirements on GPA may be waived if an applicant is currently enrolled and in good standing in a graduate degree program at UNC Charlotte.

As part of an application for the graduate certificate program, applicants are required to submit a brief (one-to-two page) statement of educational and work experience in applying information technology. All applications are handled centrally through the Office of Graduate Admissions. *Note: the admission process for the graduate certificate is separate from the admission process for a M.S. degree.*

Certificate Requirements

The Certificate requires 15 credit hours of coursework. All requirements must be completed within five years of studies, starting from the time when the first course for the certificate is taken. Coursework taken for one graduate certificate may not be counted towards a second graduate certificate.

Core Courses (6 credit hours)

ITIS 6342 - Information Technology Project Management (3)

ITIS 6362 - Information Technology: Ethics, Policy, and Security (3)

Elective Courses (9 credit hours)

Select three of the following, at least one of which must be an ITIS course:

ITIS 5166 - Backend Application Development (3)*

ITIS 6112 - Software System Design and Implementation (3)*

ITIS 6120 - Applied Databases (3)* -

ITIS 6200 - Principles of Information Security and Privacy (3)

ITIS 6230 - Enterprise and Infrastructure Protection (3)

ITIS 6400 - Human-Centered Design (3)

MBAD 5121 - Business Information Systems (3)

MBAD 6122 - Decision Modeling and Analysis via Spreadsheets (3)

MBAD 6201 - Business Intelligence and Analytics (3)

or DSBA 6201 - Business Intelligence and Analytics (3)

MBAD 6202 - Managing IT-Enabled Business Processes and Systems (3)

MPAD 6160 - Leadership in the Digital Era (3)

**Requires knowledge of data structures and object-oriented programming in C++, C#, or Java.*

Certificate Total = 15 Credit Hours

Graduate Certificate in Software Development

The Graduate Certificate in Software Development is designed for students who do not have an undergraduate degree related to computing or for students who completed a computing degree many years ago. The certificate covers foundational computer science topics that would prepare a student for a position as a software developer or for completing a Master's degree in computer-related disciplines. The certificate may be pursued concurrently with a related graduate degree program at UNC Charlotte. Courses taken in this graduate certificate can be applied toward the M.S. in Information Technology degree.

Admission Requirements

Applicants must meet the general Graduate School requirements for admission to Graduate Certificate programs. Applications must include all of the materials listed by the Graduate School as typical for Graduate Certificate application submissions.

Certificate Requirements

Required Courses (15 credit hours)

This graduate certificate is comprised of 5 required courses. Students should start with ITIS 5101 to gain experience in programming. ITIS 5135 can be taken concurrently with ITIS 5101. Both should be taken prior to the remaining 3 courses in the certificate.

ITIS 5101 - Foundations of Programming (3)

ITIS 5135 - Web-Based Application Design and Development (3)

ITIS 5166 - Backend Application Development (3)

ITIS 6112 - Software System Design and Implementation (3)

ITIS 6120 - Applied Databases (3)

Certificate Total = 15 Credit Hours

Grade Requirements

Students must achieve a 3.0 GPA to complete the certificate. No more than one grade of C may count towards the certificate.

SCHOOL OF DATA SCIENCE

datasciencephd.charlotte.edu

- **Ph.D. in Data Science**
- **M.S. in Data Science and Business Analytics**
- **Graduate Certificate in Data Science and Business Analytics**

UNC Charlotte's School of Data Science (SDS) is committed to growing exemplary talent through research and education. The School offers undergraduate and graduate degree programs and certificates that combine the fields of science, business, mathematics, social science, and sports. In strategic collaboration with industry and regional partners, the School is educating the next generation of data scientists, business analysts, and managers with the technical and critical thinking skills to model the world through data.

Graduate Degree Programs

- M.S. in Data Science and Business Analytics
- M.S. in Health Informatics and Analytics
- Master of Health Administration/M.S. in Health Informatics and Analytics Dual Degree (*see under Health Administration in the "College of Health and Human Services" section*)
- Master of Public Health/M.S. in Health Informatics and Analytics Dual Degree (*see under Public Health in the "College of Health and Human Services" section*)

Graduate Non-Degree Programs

- Graduate Certificate in Data Science and Business Analytics
- Graduate Certificate in Health Informatics and Analytics

Graduate Program

dsba.charlotte.edu

The program in Data Science and Business Analytics (DSBA) is a joint venture between the Belk College of Business, College of Computing and Informatics, and the Graduate School at UNC Charlotte. The program offers both a Graduate Certificate and a Master of Science degree designed to prepare students for the complex and rapidly changing data science and business analytics environment.

Ph.D. in Data Science

The Ph.D. in Data Science (DTSC) is transdisciplinary by design and lays emphasis on the mastery of the data science tools and methodologies and on responsible stewardship of data to cover the broad value of data science in various domains across society. Strong emphasis is placed on providing students the opportunity to demonstrate mastery of knowledge in multiple data science application domains.

The program provides research intensive doctoral-level education for students seeking Data Science careers in practice, research and teaching/academia. It is intended to produce researchers fluent in the emerging field of data science and to develop an environment for their education and training. The objectives of the Data Science Ph.D. include:

- Preparing research data scientists, professional data scientists, and scholars/academics who will be leaders in developing, maintaining, and managing data ethically and effectually to sustain the economic and social vibrancy of North Carolina and the United States;
- Developing research data scientists who have a deep understanding of data, statistics, computing, and ethics frameworks such that they can build new knowledge across fields and society by appropriate data collection, methods development, and deep analysis;
- Providing a range of educational and research experiences for a diverse group of students to participate in research initiatives at UNC Charlotte, Private, Public, and International institutions; and,
- Preparing future data science educators, and scholars, who are at the frontiers of understanding and disseminating data science knowledge.

Admission Requirements

General Admission Requirements

The DTSC PhD program seeks the following for successful applicants to the program:

1. With the equivalent to a Master's degree from a college or university accredited by an accepted accrediting body, in data science or in a related field, with a minimum undergraduate GPA of 3.0 and a minimum graduate GPA of 3.5 (on a 4.00 scale), or a baccalaureate degree from a college or university accredited by an accepted accrediting body, with an undergraduate GPA of 3.2 or above and overall outstanding academic credentials.
2. English proficiency: Any applicant whose native language is other than English must demonstrate

English proficiency. Either prior academic or work experience in an approved English-speaking country (per UNC Charlotte Graduate School guideline) or an acceptable score on the Test of English as a Foreign Language (TOEFL), International English Language Testing System (IELTS), or Duolingo English test:

- TOEFL iBT (Internet-based): 83 or higher;
- IELTS: Overall band score of 6.5 or higher;
- Duolingo English Test: 115 or higher.
- A satisfactory score (>50th percentile from the aptitude portion of the GRE). The GRE can potentially be waived if one of the following conditions is met.
- Earned a degree from an accredited U.S. college or university with a cumulative undergraduate GPA of 3.0 and above or graduate GPA of 3.5 and above.
- Hold a terminal degree (e.g., J.D., M.D., or Ph.D.).
- GRE/GMAT waiver request must be submitted in writing and approved by the Ph.D. program director before submitting the application. *Please note: a waiver of the GRE/GMAT requirement does not constitute an offer of admission into the program.

Prerequisite Courses/Background

Applicants may apply without having all prerequisites listed below at the time of application, but all prerequisites are expected to be completed prior to matriculation. Proof of completion will be required for any incomplete prerequisites if an applicant is admitted and accepts the offer of admission.

- **Mathematics:** A course or courses from an accredited college or university that covers concepts through multivariable calculus and functions in more than one dimension. Evidence of proficiency in matrix algebra via a linear algebra or similar mathematics courses from an accredited college or university.
- **Statistics:** A course or courses in Statistics from an accredited college or university that cover concepts in probability and statistical inference.
- **Programming Experience:** This experience can be demonstrated by completion of one or more computer programming courses from an accredited college or university or substantial experience working with one or more programming language (such as Python, R, Matlab, C++, or Java).

Advanced Standing Option

To be eligible for the Advanced Standing Option for the Ph.D. in Data Science program, students must meet all the admission requirements listed above AND must

demonstrate experience or courses in the following areas:

- **Statistics:** One or more courses in advanced statistics.
- **Machine Learning:** One or more courses in machine learning, artificial intelligence, or other areas of algorithmic development.
- **Visualization and communication with data:** One or more courses or equivalent experience in the visualization communication data.
- **Databases:** One or more courses or equivalent experience with the management of data.

Students can be admitted to the doctoral program on a part-time basis, including the Advanced Standing option. For admission, applicants must meet both University Graduate School requirements as well as program specific requirements. Full details on University Graduate School requirements can be found in the most recent version of the University Graduate Catalog.

Documents to be submitted for admission

1. Graduate School Application for Admission (online)
2. Application Fee: A nonrefundable, nontransferable application processing fee is required for each application submitted.
3. \$75 USD for U.S. Citizens and Permanent Residents
4. \$85 USD for International Applicants
5. Unofficial transcripts of all academic work attempted beyond high (secondary) school. An official (officially certified) final transcript must be submitted if an applicant is offered admission. International transcripts provided in a language other than English should be uploaded via the online application system, but an officially translated version should be uploaded as well.
6. Official TOEFL, IELTS, or Duolingo English test score (for applicant whose native language is other than English and must demonstrate English proficiency).
7. A personal and original statement of purpose (essay indicating research interests and motivation on study in the Ph.D. program at the School of Data Science, and one or more potential faculty advisors identified) in the range of 500 words, submitted online as part of the application material.
8. Three letters of recommendation, at least two of which are highly preferred to be from faculty members (submitted online by recommenders)
9. Official GRE/GMAT test scores.
10. A resume (online).
11. A writing sample from the most recent degree and a sample of their recent research activities and output (optional)

Application Deadlines

Deadlines are in accordance with UNC Charlotte Graduate School deadlines. However, to ensure full consideration for financial support, applications must be received by February 1st, 5PM EST for Fall admission.

Degree Requirements – Advanced Standing Option (42 credit hours)

Students admitted to the Advanced Standing option of the program must complete 36 credit hours of core requirements (18 credits of course work and 18 credits of Dissertation Research - DTSC 8900) and 6 credit hours of electives with the approval of their advisor and of the DTSC Program Director. In addition, students must take GRAD 8302 (Responsible Conduct of Research) and GRAD 8990 (Academic Integrity).

Data Science Courses (18 credit hours)

DTSC 8110 - Statistics for Data Science (3)
 DTSC 8120 - Fundamentals of Machine Learning (3)
 DTSC 8130 - Ethics, Security, Privacy, & Governance of Data for Social Good (3)
 DTSC 8140 - Fundamentals of Artificial Intelligence (3)
 DTSC 8600 - Research Design for Data Science (2)
 DTSC 8601 - Data Science Research Seminar (1) x4

Responsible Conduct of Research

GRAD 8302 - Responsible Conduct of Research (2)
 GRAD 8990 - Academic Integrity (0)

Dissertation Research (18 credit hours)

DTSC 8900 - Dissertation Research (1 to 9)

Electives (6 credit hours)

6 credit hours of electives, provided that they would be relevant to the student's program of study and research, with the approval of student's advisor and of the DTSC Program Director.

Degree Requirements – Standard Standing Option (72 credit hours)

Students admitted to the Standard Standing option of the program must complete 36 credit hours of core requirements (18 credits of course work and 18 credits of Dissertation Research - DTSC 8900) and 36 credit hours of electives with the approval of their advisor and of the DTSC Program Director. In addition, students must take GRAD 8302 (Responsible Conduct of Research) and GRAD 8990 (Academic Integrity).

Data Science Courses (18 credit hours)

DTSC 8110 - Statistics for Data Science (3)
 DTSC 8120 - Fundamentals of Machine Learning (3)
 DTSC 8130 - Ethics, Security, Privacy, & Governance of

Data for Social Good (3)
 DTSC 8140 - Fundamentals of Artificial Intelligence (3)
 DTSC 8600 - Research Design for Data Science (2)
 DTSC 8601 - Data Science Research Seminar (1) x4

Responsible Conduct of Research

GRAD 8302 - Responsible Conduct of Research (2)
 GRAD 8990 - Academic Integrity (0)

Dissertation Research (18 credit hours)

DTSC 8900 - Dissertation Research (1 to 9)

Electives (36 credit hours)

36 credit hours of electives, provided that they would be relevant to the student's program of study and research, with the approval of student's advisor and of the DTSC Program Director.

Degree Total = 72 credit hours (42 credit hours for students with advanced standing)

M.S. in Data Science and Business Analytics

The Data Science and Business Analytics (DSBA) program is a professional degree offered through a partnership between the Belk College of Business and the College of Computing and Informatics at UNC Charlotte. It is designed for both working professionals and full-time students. The program offers a Graduate Certificate and a Master of Science degree, both of which prepare students for the complex and rapidly evolving fields of data science and business analytics.

The M.S. in Data Science and Business Analytics (DSBA) is an interdisciplinary program that integrates business, computer science, statistics, and operations research. It combines business insight, data expertise, advanced analytics techniques, and practical experience to address real-world business challenges. DSBA MS graduates are prepared for positions in data-driven industries such as finance, energy, retail, and healthcare, where the demand for skilled data scientists is rapidly increasing.

Admission Requirements

Applicants must meet the general Graduate School requirements for admission to master's degree programs. Applications must include all of the materials listed by the Graduate School as typical for master's degree application submissions. In addition to the general requirements for admission to the Graduate School, an earned baccalaureate degree from a college or university accredited by an accepted accrediting body in any

scientific, engineering, or business discipline or a closely related field is required. Official GRE or GMAT scores are required for all applicants without an earned baccalaureate degree or higher from an accredited U.S. college or university. Applicants who do not meet a minimum undergraduate GPA of 3.0 (4.0 scale) require GRE or GMAT scores.

In addition, prior to matriculation, the program requires:

- A current working knowledge of at least one higher-level (procedural) language; and a familiarity with computer applications
- A minimal background in mathematics is also required, including one semester of calculus and one semester of statistics

Individuals who have worked at a high professional level in the computer industry or business may be able to substitute work experience for specific subject area admission requirements.

GRE/GMAT Waiver

The GRE/GMAT requirement may be waived for applicants who meet one of the following:

- Earned a degree from an accredited U.S. college or university with a cumulative undergraduate GPA of 3.0 and above
- Hold a terminal degree (e.g., J.D., M.D., or Ph.D.)
- Have successfully completed a minimum of two of the required courses in the Graduate Certificate in Data Science and Business Analytics with a GPA of 3.5 or above, and a letter of recommendation from at least one of the DSBA course instructors

Waiver from GRE/GMAT must be requested from the DSBA Graduate Program Director when submitting the completed application. All waivers are at the discretion of the DSBA Graduate Program Director. Applicants satisfying one of the above criteria may be asked by the DSBA Graduate Program Director to report GRE/GMAT scores.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward a graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Accelerated Master's Program

Academically talented high school seniors and UNC Charlotte undergraduate freshmen are encouraged to

apply for the Accelerated Master's Program to begin work toward both undergraduate and graduate degrees in their Freshman year. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Accelerated Master's Programs.

Degree Requirements

To earn the DSBA, M.S. degree, students are required to complete thirty-three graduate credit hours. This is broken down into 18 credit hours of core courses, 12 or 9 credit hours of electives, and a capstone requirement of either 3 credit hours for an Internship or 6 credit hours for a Master Thesis. A minimum of 21 credit hours contributing to the M.S. in Data Science and Business Analytics must be from courses numbered 6000 or higher. A maximum of 6 hours of graduate credit may be transferred at the discretion of the Graduate Program Director. All credit hours earned in the Graduate Certificate in Data Science and Business Analytics can be applied toward the M.S. degree with the approval of the DSBA Graduate Program Director.

Required Courses (18 credit hours)

DSBA 5122 - Visual Analytics and Storytelling (3)
 DSBA 6156 - Machine Learning (3)
 DSBA 6160 - Database Systems for Data Scientists (3)
 DSBA 6201 - Business Intelligence and Analytics (3)
 DSBA 6211 - Advanced Business Analytics (3)
 DSBA 6276 - Strategic Business Analytics (3)

Elective Courses (9 or 12 credit hours)

At least one course must be from the list of Data Science Elective Courses and one must be from the list of Business Analytics Elective Courses.

Data Science Elective Courses

DSBA 6155 - Knowledge-Based Systems (3)
 DSBA 6162 - Data Mining (3)
 DSBA 6165 - Artificial Intelligence and Deep Learning (3)
 DSBA 6180 - AI and Model Risk Management (3)
 DSBA 6188 - Text Mining and Information Retrieval (3)
 DSBA 6190 - Cloud Computing for Data Analysis (3)
 DSBA 6345 - Modern Data Science Systems (3)
 DSBA 6322 - Complex Adaptive Systems (3)
 DSBA 6326 - Network Science (3)

Business Analytics Elective Courses

DSBA 6100 - Big Data Analytics for Competitive Advantage (3)
 DSBA 6112 - Graduate Econometrics (3)
 DSBA 6122 - Decision Modeling and Analysis (3)
 DSBA 6207 - Business Project Management (3)
 DSBA 6208 - Supply Chain Management (3)
 DSBA 6213 - Applied Healthcare Business Analytics (3)
 DSBA 6277 - Social Media Marketing and Analytics (3)

DSBA 6284 - Digital Marketing Analytics (3)

Other Elective Courses

DSBA 6010 - Special Topics in Data Science and Business Analytics (3)
 DSBA 6115 - Statistical Learning with Big Data (3)
 DSBA 6170 - Ethics, Privacy, Security and Governance of Big Data (3)

Capstone Requirements (3 or 6 credit hours)

Students can opt for either an Internship, Project-Based Practicum Course or a Master's Thesis as their capstone experience.

Internship: Students choosing the internship option must complete 3 credit hours of internship experience.

Project-Based Practicum Course: Students choosing this option must complete 3 credit hours in DSBA 6390, working on real-world data projects in a structured, supervised environment.

Master Thesis: This option is tailored for students aiming for research-oriented careers or doctoral studies. candidates are required to compile an original research thesis, acceptable to a three-member committee, including an SDS joint or affiliate graduate faculty chair. The thesis necessitates a commitment of at least two semesters. A total of 6 credit hours from DSBA 6991 - Master Thesis Research are required, which can be spread across a minimum of two semesters (e.g., 1+5, 3+3, 2+2+2).

Capstone Courses (3 or 6 credit hours)

Three credit hours of DSBA 6400 Internship or DSBA 6390 - Data Science and Business Analytics Project Practicum, or a total of 6 credit hours from DSBA 6991 Master Thesis Research, spreading across a minimum of two semesters, are required.

DSBA 6390 - Data Science and Business Analytics Project Practicum (3)
 DSBA 6400 - Internship (3)
 DSBA 6991 - Master Thesis Research (1 to 5)

Degree Total = 33 Credit Hours

Graduate Certificate in Data Science and Business Analytics

The Graduate Certificate in Data Science and Business Analytics (DSBA) provides post-baccalaureate students with the opportunity to reach a demonstrated level of competence in the area of data science and business analytics. The certificate requires 15 graduate credit hours of coursework. The certificate may be pursued

concurrently with a related graduate degree program at UNC Charlotte.

Admission Requirements

The Graduate Certificate in DSBA is open to all students who:

- Hold a B.S. or M.S. degree in any scientific, engineering, or business discipline
- Are either (a) enrolled and in good standing in a graduate degree program at UNC Charlotte or (b) complete their undergraduate degree with a minimum 2.75 GPA

In addition, prior to matriculation, the program requires:

- A current working knowledge of at least one higher-level (procedural) language; and a familiarity with computer applications
- A minimal background in mathematics is also required, including one semester of calculus and one semester of statistics

Individuals who have worked at a high professional level in the computer industry or business may be able to substitute work experience for specific subject area admission requirements.

Certificate Requirements

The certificate is awarded upon completion of five graduate level courses (15 credit hours) in the area of data science and business analytics.

Required Core Courses (6 credit hours)

DSBA 5122 - Visual Analytics and Storytelling (3)

DSBA 6100 - Big Data Analytics for Competitive Advantage (3)

DSBA 6201 - Business Intelligence and Analytics (3)

DSBA 6276 - Strategic Business Analytics (3)

Elective Courses (3 credit hours)

Select one course from the following.

DSBA 6100 - Big Data Analytics for Competitive Advantage (3)

DSBA 6122 - Decision Modeling and Analysis (3)

DSBA 6156 - Applied Machine Learning (3)

DSBA 6188 - Text Mining and Information Retrieval (3)

DSBA 6211 - Advanced Business Analytics (3)

DSBA 6284 - Digital Marketing Analytics (3)

DSBA 6326 - Network Science (3)

Certificate Total = 15 Credit Hours

Grade Requirements

A cumulative GPA of 3.0 is required and, at most, one course with a grade of C may be allowed towards the

certificate.

HEALTH INFORMATICS AND ANALYTICS

- **M.S. in Health Informatics and Analytics**
 - Data Science
 - Health Services Outcomes
- **MHA/M.S. in Health Informatics and Analytics Dual Degree** (*see under Health Administration in the “College of Health and Human Services” section*)
- **MPH/M.S. in Health Informatics and Analytics Dual Degree** (*see under Public Health in the “College of Health and Human Services” section*)
- **Graduate Certificate in Health Informatics and Analytics**

Graduate Program

hia.charlotte.edu

M.S. in Health Informatics and Analytics

The Health Informatics and Analytics, housed within School of Data Science, is an interdisciplinary initiative that leverages the expertise of its parent colleges—the College of Health and Human Services and the College of Computing and Informatics—to equip students with skills in data science and health analytics. Designed for both full-time and part-time students, the program prepares them to advance the field through data-driven decision-making and professional practice.

Our mission is centered on education, research, and service, with key objectives:

- Advancing research on the design, operation, and analysis of healthcare information systems and health-related data.
- Applying expertise to support health leaders and communities in improving public health outcomes.

As a national leader in integrating data science and analytics with healthcare, the program is committed to developing innovative practitioners who drive advancements in population health.

Students can choose between two concentrations:

- Health Services Outcomes (HSO) Concentration
 - Ideal for students with a health-related

background.

- Data Science (DS) Concentration – Best suited for those with experience in computing and statistics. The DS Concentration requires proficiency in a high-level programming language (e.g., Python, Java, R, or C/C++), familiarity with computer systems, and recommended coursework in calculus, statistics, and linear algebra.

Admission Requirements

Applicants must meet the general Graduate School requirements for admission to master's degree programs. Applications must include all of the materials listed by the Graduate School as typical for master's degree application submissions. In addition to the general requirements for admission to the Graduate School, an earned baccalaureate degree from a college or university accredited by an accepted accrediting body in computer sciences, health sciences, information systems, or life sciences or in an informatics discipline or a closely related field is required for study toward the M.S. in Health Informatics and Analytics. Acceptable scores on the verbal, quantitative, and analytical sections of the GRE are required.

GRE Waiver

The GRE requirement may be waived for applicants who meet one of the following:

- Hold a terminal degree (e.g., J.D., M.D., D.D.S., or Ph.D.)
- Have a cumulative undergraduate or graduate GPA of 3.0 and above from a college or university accredited by an accepted accrediting body
- Have successfully completed a minimum of two of the required courses in the Graduate Certificate in Health Informatics and Analytics with a GPA of 3.5 or above, and a letter of recommendation from at least one of the HIA course instructors

Waiver must be requested from the HIA Graduate Program Director when submitting the completed application. All waivers are at the discretion of the HIA Graduate Program Director. Applicants satisfying one of the above criteria may be asked by the HIA Graduate Program Director to report GRE scores.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The M.S. in Health Informatics and Analytics program requires 36 graduate credit hours, including 6 credit hours of Foundational Core courses, 12 credit hours of Core courses, 9 hours of Selective courses, 6 credit hours of Restricted Elective courses, and 3 credit hours of a Culminating Experience that can be satisfied by either an HCIP 6400 Internship or HCIP 6250 Problem Solving in Healthcare Analytics course.

A maximum of 6 hours of graduate credit may be transferred. Students may apply all of the credits earned in the Graduate Certificate in Health Informatics and Analytics towards the M.S. in Health Informatics and Analytics.

The M.S. courses that also serve the Graduate Certificate in Health Informatics and Analytics program are available via online delivery as well as face-to-face formats, meaning much (but not all) of the M.S. program is available in an online format.

Applicants lacking a college-level statistics course within 5 years of matriculation may be required to take HADM 6108 (Decision Analysis) or a comparable course upon entering the program. This course would not count toward degree requirements.

By the end of the first semester of matriculation in the program, students must complete (or be excused from based upon prior training and/or experience) non-credit asynchronous training modules in computer vocabularies, programming systems, health vocabularies, and classification systems.

Upon entering into the HIA program, students shall choose in consultation with the Program Director one of the two concentrations, the Health Services Outcomes (HSO) Concentration or the Data Science (DS) Concentration, based on their prior training and experience. These concentrations are designed to provide guidance for course selection and career planning. The HSO Concentration is most suitable for students with a health-related background, while the DS Concentration assumes more background in computing and statistics. Each concentration has its own selection of Foundational Core, Core, and Selective courses. They share the same broad selection of Restrictive Elective courses.

Students who choose the Data Science Concentration should have current working knowledge of at least one high-level programming language (e.g., Python, Java, R, or C/C++/C#); and a familiarity with computer systems and applications. A minimal background in mathematics, including two semesters of calculus and one semester of statistics, are recommended. One course in linear algebra

is also highly desirable.

Health Services Outcomes Concentration

Foundational Core Courses (6 credit hours)

Within the first year of matriculation into the program, students must complete these foundational core requirements. The Graduate Program Director may approve substituting HCIP electives for either or both of these classes in cases where the student demonstrates having successfully completed comparable undergraduate and/or graduate coursework.

HADM 6100 - Introduction to the U.S. Healthcare System (3)

HCIP 5376 - Introduction to Programming for Health Informatics (3)

Core Courses (12 credit hours)

HCIP 6102 - Healthcare Data Analysis (3)

HCIP 6160 - Database Systems for Data Scientists (3)

HCIP 6201 - Health Information Privacy and Security: Law, Ethics, and Technology (3)

HCIP 6380 - Introduction to Health Informatics (3)

Selective Core Courses (9 credit hours)

Select at least three of the following courses. Additional selections from these options are encouraged and will fulfill the restricted elective requirement described below. Do not select HCIP 6250 if this course is chosen as the Culminating Experience.

HCIP 5122 - Visual Analytics (3)

HCIP 6108 - Intermediate Decision Analysis in Healthcare (3)

HCIP 6250 - Capstone: Problem-Solving in Healthcare Analytics (3)

HCIP 6393 - Health Data Integration (3)

HCIP 6396 - Business Intelligence in Healthcare (3)

Data Science Concentration

Foundational Core Courses (6 credit hours)

Within the first year of matriculation into the program, students must complete these foundational core requirements. The Graduate Program Director may approve substituting HCIP electives for either or both of these classes in cases where the student demonstrates having successfully completed comparable undergraduate and/or graduate coursework.

HADM 6100 - Introduction to the U.S. Healthcare System (3)

HCIP 6380 - Introduction to Health Informatics (3)

Core Courses (12 credit hours)

HCIP 5122 - Visual Analytics (3)

HCIP 6156 - Applied Machine Learning (3)

HCIP 6160 - Database Systems for Data Scientists (3)

HCIP 6201 - Health Information Privacy and Security: Law, Ethics, and Technology (3)

Selective Core Courses (9 credit hours)

Select at least three of the following courses. Additional selections from these options are encouraged and will fulfill the restricted elective requirement described below. Do not select HCIP 6250 if this course is chosen as the Culminating Experience.

DSBA 6165 - Artificial Intelligence and Deep Learning (3)

DSBA 6345 - Modern Data Science Systems (3)

HCIP 6108 - Intermediate Decision Analysis in Healthcare (3)

HCIP 6250 - Capstone: Problem-Solving in Healthcare Analytics (3)

HCIP 6393 - Health Data Integration (3)

Restricted Elective Courses (6 credit hours)

Select and complete 6 additional credit hours in other HCIP, HADM, DSBA, ITCS, and ITIS course offerings. The Graduate Program Director may approve substituting demonstrably relevant non-HCIP offerings to fulfill all or part of this requirement.

Culminating Experience (3 credit hours)

All students must complete a Culminating Experience in this program. Students may select one of the following courses to satisfy this requirement.

The HCIP 6400 Internship Project course may be taken after students have completed a minimum of 12 credit hours in the degree program, including HADM 6100 and HCIP 6380.

The HCIP 6250 Problem-solving in Healthcare Analytics course is normally taken in the final semester; all students complete this capstone course that engages them in a mentored real world informatics and analytics project.

To register for either Culminating Experience course, students must secure permission from the course instructor or the Graduate Program Director.

HCIP 6250 - Capstone: Problem-Solving in Healthcare Analytics (3)

HCIP 6400 - Health Informatics and Analytics Internship Project (3)

Degree Total = 36 Credit Hours

Graduate Certificate in Health Informatics and Analytics

The Graduate Certificate in Health Informatics and Analytics (HIA) provides individuals with a foundational understanding of data management and analysis in healthcare. This 15-credit-hour program includes coursework along with required non-credit activities to demonstrate competency. Courses are delivered in person at UNC Charlotte.

The certificate can be pursued independently or concurrently with a related graduate degree at UNC Charlotte. It also serves as the first phase of the Master's program in Health Informatics and Analytics (HIA M.S.), offering a seamless transition for students who wish to continue their studies. All 15 credit hours earned in the certificate program can be applied toward the HIA M.S. degree.

Students planning to transition into other master's programs at UNC Charlotte should consult the program director to determine which courses may be applicable. Those concurrently enrolled in another graduate program may double count up to 9 credit hours toward both the certificate and their degree. However, transfer credits cannot be applied to this certificate program.

Admission Requirements

Applicants must meet the general Graduate School requirements for admission to Graduate Certificate programs. Applications must include all of the materials listed by the Graduate School as typical for Graduate Certificate application submissions. In addition to the general requirements for admission to the Graduate School, an earned baccalaureate degree from a college or university accredited by an accepted accrediting body in computer sciences, health sciences, information systems, or life sciences or in an informatics discipline or a closely related field is required for study toward the Graduate Certificate in Health Informatics and Analytics.

Certificate Requirements

The Graduate Certificate in Health Informatics and Analytics program requires 15 graduate credit hours. By the end of the first semester of matriculation in the program, students must complete (or be excused from based upon prior training and/or experience) non-credit asynchronous training modules in computer vocabularies, programming systems, health vocabularies, and classification systems.

Foundational Core Courses (6 credit hours)

Within the first year of matriculation into the program, students must complete these foundational core

requirements. The Graduate Program Director may approve substituting another HCIP course for either or both of these classes in cases where the student demonstrates having successfully completed comparable undergraduate and/or graduate coursework.

HADM 6100 - Introduction to the U.S. Healthcare System
(3)

HCIP 5376 - Introduction to Programming for Health
Informatics (3)

Core Courses (9 credit hours)

HCIP 6102 - Healthcare Data Analysis (3)

HCIP 6160 - Database Systems for Data Scientists (3)

HCIP 6380 - Introduction to Health Informatics (3)

Certificate Total = 15 Credit Hours



Cato College of Education

education.charlotte.edu

At the University of North Carolina at Charlotte, graduate students in the Cato College of Education have many different opportunities to expand their knowledge and skills in preparation for new educational roles and increased leadership responsibilities. While many professional education programs lead to advanced NC licensure, other programs lead to both initial and advanced licensure, and still others are not associated with licensure. The Cato College of Education is accredited by the Council for the Accreditation of Educator Preparation (CAEP), and the Counseling programs are accredited by the Council on Accreditation of Counseling and Related Programs (CACREP). All licensure programs are approved by the North Carolina State Board of Education. Program graduates positively influence their peers, clients, and students; contribute to the development of effective schools and agencies for all children; and work to alleviate and prevent many of today's educational and social obstacles. The curricula of most of the Cato College of Education's teacher education programs align with the core propositions, skill sets, academic language, and concepts from the National Board of Professional Teaching Standards (NBPTS).

One of the college's most important functions is to serve as a regional resource in education, research, and service to help address the challenges of urban schools. The college has a strong partnership with the 12 school districts in the Southwest Education Alliance and is located within the bounds of Charlotte-Mecklenburg Schools (CMS), a large urban district.

Doctoral Programs

- **Doctor of Education (Ed.D.)**
 - Educational Leadership
- **Doctor of Philosophy (Ph.D.)**
 - Counselor Education and Supervision
 - Curriculum and Instruction
 - Educational Research, Measurement, and Evaluation
 - Special Education

Master's Degree Programs

- **Master of Arts (M.A.)**
 - Counseling
 - English Education (*Advanced licensure; see under English in the College of Liberal Arts & Sciences section*)
- **Master of Arts in Teacher Education (M.A.T.)**

Combines Initial and Advanced licensure

 - Career and Technical Education (6-12)
 - Child and Family Studies: Early Education (Birth-Kindergarten)
 - Elementary Education (K-6)
 - Foreign Language Education (K-12)
 - Middle Grades Education (6-9)

- Secondary Education (9-12)
- Special Education (K-12)
- Teaching English as a Second Language (K-12)

• Master of Education (M.Ed.)

Advanced licensure

- Curriculum and Instruction (6-9, 9-12, K-12) *(Also offers a non-licensure concentration)*
- Elementary Education (K-6)
- Learning, Design, and Technology (K-12) *(Also offers a non-licensure concentration)*
- Reading Education (K-12)
- Special Education and Child Development (K-12) *(includes four concentration areas)*

Non-licensure

- Educational Leadership (Higher Education)
- Urban Education

• Master of School Administration (M.S.A.)

Advanced licensure

- School Administration (K-12)

• Master of Science (M.S.)

- Mathematics Education *(Advanced licensure; see under Mathematics and Statistics in the College of Liberal Arts & Sciences section)*

Graduate Non-Degree Programs

• Graduate Certificates

- Advanced Literacy Instruction and Intervention
- Applied Behavior Analysis
- Autism Spectrum Disorder
- Early Childhood Mental Health *(in collaboration with College of Health and Human Services)*
- Instructional Coaching
- Play Therapy
- Quantitative Analyses
- Self, Systems and Social Transformation (SSST)

• Graduate Certificates

Leading to Initial Teacher Licensure (ideal for individuals who have a bachelor's degree in another area and are interested in a career in education)

- Career and Technical Education (business, marketing, technology, family, and consumer science)**
- Child and Family Development (Birth through Kindergarten)
- Elementary Education (K-6)

- Fine and Performing Arts Education: Art (K-12) *(in collaboration with College of Arts + Architecture)*
- Foreign Language Education (K-12)*
- Middle Grades Education (6-9)
- Secondary Education (9-12)
- Special Education (K-12)
- Teaching English as a Second Language (K-12)

** Due to limited availability of internship sites, candidates seeking licensure in certain languages must be residency teachers and complete the internship in their own classrooms.*

*** The Career and Technical Education license spans grades 6-12 and is a concentration of the Graduate Certificate in Middle and Secondary Education.*

• Graduate Certificates

Leading to Add-On Licensure (ideal for individuals who have a teaching license and bachelor's degree and would like to add an area to their current teaching license)

- Elementary Mathematics Education (K-6)
- Special Education: Academic or Intellectually Gifted (K-12)
- Learning, Design, and Technology (K-12)***

**** Individuals do not have to have a teaching license in order to pursue this graduate certificate, but if they do, they can receive the 0.79 special endorsement.*

• Post-Master's Certificate Programs

- Addiction Counseling
- Qualitative Research
- School Administration
- School Counseling
- University and College Teaching

CHILD AND FAMILY STUDIES

- Master of Education (M.Ed.) in Special Education and Child Development (*see the Special Education section*)
- Master of Arts in Teaching (M.A.T.) in Child and Family Studies: Early Childhood Education (Birth-Kindergarten)
- Graduate Certificate in Child and Family Development: Birth through Kindergarten
- Graduate Certificate in Early Childhood Mental Health

Department of Special Education and Child Development
spcd.charlotte.edu

M.A.T. in Child and Family Studies: Early Childhood Education (Birth-Kindergarten)

The Master of Arts in Teaching (M.A.T.) program is designed for individuals who have completed the Graduate Certificate in Child and Family Development: Birth through Kindergarten. The M.A.T. program is a 35 credit hour program comprised of two phases, the Graduate Certificate phase (Phase I) and the Master's degree completion phase (Phase II). Completion of Phase I of the M.A.T. leads to the North Carolina Standard Professional 1 (SP1) Professional Educator's License in Birth-Kindergarten. Phase I requires 21 credit hours of coursework, including the graduate internship experience. Upon completion of Phase I, qualified candidates may apply for Phase II to work towards the Master's degree and qualify for the North Carolina Standard Professional 2 (SP2) Professional Educator's License.

All courses for both phases of the M.A.T. must be completed within seven years. Coursework within Phase I/Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to admission information in the "Graduate School" section of this *Catalog*.

Admission Requirements

Graduate Certificate in Teaching (M.A.T. Phase I Initial licensure only)

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 3.0. (*For alternative ways to demonstrate academic competence, applicants may contact the Office of Teacher Education Advising and Licensure (TEAL)*)
- 3) Three recommendations from persons knowledgeable of the applicant's interaction with children and families
- 4) A statement of purpose
- 5) A clear criminal background check
- 6) Apply online at gradadmissions.charlotte.edu

M.A.T. (Phase II) Program

- 1) Completion of the Graduate Certificate in Teaching
- 2) A minimum graduate GPA of 3.5 in the Graduate Certificate in Teaching*
- 3) One recommendation from a full-time faculty member who has taught the applicant in the Graduate Certificate in Teaching program
- 4) A statement of purpose
- 5) Apply online at gradadmissions.charlotte.edu

**Students with a GPA below 3.5 in the Graduate Certificate in Teaching may be considered for admission to the M.A.T. program with scores above the 30th percentile on either the Graduate Record Exam or Miller Analogies Test.*

Degree Requirements

Phase I/ Graduate Certificate Required Courses (21 credit hours)

- CHFD 5100 - Development: Prenatal to Pre-Adolescence (3)
- CHFD 5250 - Assessment of Young Children (3)
- CHFD 6110 - Family-Professional Partnerships (3)
- CHFD 6200 - Curriculum and Learning Environments for Young Children (3)
- CHFD 6230 - Emerging Literacy and Mathematical Understanding (3)
- CHFD 6400 - Student Teaching Seminar: B-K Child and Family Development (6)

Phase II/ Completion of the M.A.T. Required Courses (14 credit hours)

- RSCH 6101 - Research Methods (3)
- CHFD 6300 - Evidence-Based Practices in Child and Family Studies (3)

CHFD 6330 - Action Research Development and Proposal (3)

CHFD 7200 - Leadership in Child and Family Studies (3)

CHFD 7691 - Project Implementation in Child and Family Studies (2)

Degree Total = 35 Credit Hours

Capstone Experiences

The capstone experience for the M.A.T. will be fulfilled by completing the action research project.

Advising

Upon acceptance into the program, all students are assigned an advisor. Students are expected to meet with their advisor each semester to discuss their coursework.

Licensure

Upon successful completion of the M.A.T. Phase I/Graduate Certificate, students are recommended for the North Carolina Standard Professional 1 (SPI) Professional Educator's License. For this initial license, students are required to complete an electronic licensure portfolio that is created during coursework and the internship. Upon successful completion of the M.A.T. Phase II, students are recommended for the North Carolina Standard Professional 2 (SP2) Professional Educator's License. For the Professional 2 license, students are required to complete an advanced electronic licensure portfolio during coursework.

Committees

Students should consult with their academic program advisor in the selection of the committee. The committee chair should be selected for content knowledge of the subject area that is selected for the culminating experience. This person should hold a graduate faculty appointment in the CHFD program. Two additional committee members should be selected for knowledge and expertise in the student's subject area. One of the additional members may be external to the student's department.

Graduate Certificate in Child and Family Development: Birth Through Kindergarten

The Graduate Certificate in Child and Family Development: Birth through Kindergarten is a 24 credit hour program that prepares professionals for careers that serve young children with and without disabilities and their families. It is designed for prospective students already working in professional settings who wish to pursue a North Carolina Standard Professional 1 (SPI) Professional

Educator's License in Birth-Kindergarten (B-K) on a part-time basis.

All courses for the Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to admission information in the "Graduate School" section of this *Catalog*.

Admission Requirements for Graduate Certificate in Teaching Programs

- 1) An undergraduate degree in a related field* from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.75*
- 3) Two professional references in a supervisory capacity (i. e. principal or manager) and/or academic references (i. e. professor)
- 4) A statement of purpose
- 5) A clear criminal background check
- 6) Apply online at gradadmissions.charlotte.edu

**For alternative ways to demonstrate academic competence, applicants may contact the Office of Teacher Education Advising and Licensure (TEAL)*

Certificate Requirements

The NC State Board of Education requires that B-K candidates demonstrate content mastery with 24 relevant credit hours. Due to the 24 credit hour curriculum of this certificate, students who do not have 6 relevant credit hours at the time of admission will be required to complete those hours in addition to the standard program of study prior to student teaching. Contact the Office of Teacher Education Advising and Licensure for assistance with determining relevant credit hours.

Required Courses (18 credit hours)

CHFD 5100 - Development: Prenatal to Pre-Adolescence (3)

CHFD 5250 - Assessment of Young Children (3)

CHFD 6110 - Family-Professional Partnerships (3)

CHFD 6200 - Curriculum and Learning Environments for Young Children (3)

CHFD 6205 - Integrated Instructional Applications in Child and Family Development (3 or 6)

CHFD 6230 - Emerging Literacy and Mathematical Understanding (3)

Internship (6 credit hours)

A 6 credit hour internship is required for Graduate Certificate students. The graduate-level internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate

their readiness for the North Carolina Standard Professional 1 (SP1) Professional Educator's License. Students are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and university faculty. This internship may be completed in a candidate's employment site which meets placement criteria or the University can find a placement for the student. Lateral entry teachers and teacher assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the internship experience and licensure requirements. This contact should take place at least one semester before the internship.

CHFD 6400 – Student Teaching Seminar: B-K Child and Family Development (6)

Total Hours = 24 Credit Hours

Content Courses = 18 hours

Internship (Student Teaching) = 6 hours

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisor at least once each semester.

Application for Degree

The Application for Degree/Graduation form supplied by the Graduate School must be received early in the last semester of the student's program.

Clinical Field Experiences

Most courses require students to develop their knowledge, skills, and dispositions in community-based settings. *All students are expected to complete clinical experiences in at least two significantly different settings.* Candidates who are residency teachers and teacher assistants must move beyond their own classrooms, and employed candidates are encouraged to seek assistance and support from their administrators.

Licensure

Upon successful completion of the Graduate Certificate, candidates are recommended for the North Carolina Initial Professional Educator's License. For this license, students are required to complete an electronic licensure portfolio that is created during coursework and the internship. Students apply for the North Carolina Initial Professional Educator's License in the TEAL Office.

Beginning Fall 2019, all candidates must meet the minimal cut score requirement on edTPA and meet all other student teaching requirements in order to receive a licensure recommendation. For details, see edassessment.charlotte.edu/edtpa-information.

Graduate Certificate in Early Childhood Mental Health

The Graduate Certificate in Early Childhood Mental Health (ECMH) program is sponsored jointly by UNC Charlotte's School of Social Work and Department of Special Education and Child Development. It is an interdisciplinary post-baccalaureate certificate program that addresses the increasing need for mental health services for children from birth to five years of age. There is growing interest in infant and early childhood mental health; however, young children are rarely the focus of graduate training programs. Whereas mental health work with older children emphasizes increased personal choice-making and negotiation skills, mental health work with younger children is focused on the quality of the child's relationships, resources, and social environment. Consequently, parents and other caretakers are a much more integral part of prevention and intervention efforts for young children. Graduates of the EMCH certificate program will be able to:

- Promote awareness about the importance of early childhood mental health
- Work with diverse families with young children
- Identify evidence-informed services for young children and their families
- Recognize, refer, and perform ecologically valid mental health assessments of young children
- Explain the relationships between social, cognitive, and communication development in young children
- Support positive, relationship-focused communication between young children and their caretakers
- Facilitate positive social-communication skills between young children and their caretakers in a variety of settings

General Requirements for Admission to the Graduate School

Please refer to admission information in the "Graduate School" section of this *Catalog*.

Graduate Certificate Program Admission Requirements

The ECMH certificate program welcomes professionals with a completed undergraduate or graduate degree in a human services field, including: counseling, education, early childhood special education, pediatrics, allied health services (i.e., occupational therapy, physical therapy, speech-language pathology), psychology, and social work. Individuals who are currently enrolled in a human service-

related graduate degree program at UNC Charlotte are also welcome to apply to the ECMH certificate program.

Admission to the Graduate Certificate in ECMH requires the following:

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.75 *(For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL))*
- 3) Three recommendation letters from persons knowledgeable of your interaction with children or youth *(Applicants to the ECMH certificate program who are already enrolled in a graduate degree program in the School of Social Work or Department of Special Education and Child Development are not required to submit letters of recommendation)*
- 4) Statement of purpose
- 5) Clear criminal background check
- 6) Apply online at graduateschool.charlotte.edu

Students interested only in the Graduate Certificate in ECMH are not required to take the GRE or MAT. Certificate students who later wish to apply to the M.S.W. or M.Ed. programs must follow all admissions requirements for those programs, including entrance examinations. Successful completion of courses in the ECMH certificate program does not guarantee admission to any other UNC Charlotte graduate program. If a certificate-only student would like to apply for admission to either the M.S.W. or M.Ed. program, the student must complete an additional graduate application. Students can begin the ECMH certificate program during any semester.

If an ECMH Graduate Certificate student is accepted into a master's degree program, courses completed in the Graduate Certificate program may be applied toward the Master of Social Work program or the M.Ed. in Child and Family Studies program at the discretion of the Graduate Program Director of the program to which the student applies and in compliance with existing University policy. However, credits earned in one certificate program may not be used to satisfy the requirements of a second certificate program. Additionally, all courses for the master's degree must be completed within seven years of initial enrollment. All courses for the Graduate Certificate in ECMH only must be completed within five years from initial enrollment in the certificate program.

Certificate Requirements

The certificate program requires a minimum of 12 graduate credit hours. Courses are offered asynchronously (no class meetings) and are fully online. Courses required for the ECMH certificate program can be taken in any order.

Required Courses (12 credit hours)

CHFD 6240 - Advanced Studies in Infant and Child Development (3)
 SOWK 5366 - Early Childhood Mental Health (3)
 SPED 6242 - Enhancing Communication and Supporting Behavior in Early Childhood Settings (3)
 SPED 6350 - Young Children with Disabilities and their Families: Interdisciplinary Collaboration (3)

Note: Course prerequisites and corequisites for CHFD 6240 and SPED 6242 are waived for students completing only the Graduate Certificate in Early Childhood Mental Health. Permission of the Graduate Program Director is required for enrollment in courses with prerequisites.

Certificate Total = 12 Credit Hours

COUNSELING

- **Ph.D. in Counselor Education and Supervision**
 - Play Therapy
- **M.A. in Counseling**
 - Addiction
 - Clinical Mental Health
 - Play Therapy
 - School Counseling
- **Post-Master's Certificate in Addiction Counseling**
- **Graduate Certificate in Play Therapy**
- **Post-Master's Certificate in School Counseling**

Department of Counseling
counseling.charlotte.edu

Ph.D. in Counselor Education and Supervision

The Ph.D. in Counselor Education and Supervision is designed to provide doctoral-level preparation for professionals who seek higher education positions in counselor preparation programs and advanced clinical training and leadership positions in the counseling field. A unique feature of this program is its emphasis on increasing knowledge, awareness, and skills in interacting with socially and culturally diverse populations. The program addresses professional roles in five doctoral core areas: (1) counseling, (2) supervision, (3) teaching, (4) research and scholarship, and (4) leadership and advocacy. These five doctoral core areas represent the foundational knowledge required of doctoral graduates in counselor education. Doctoral-level students in counselor education may work as counselor educators, counselor supervisors, direct service providers, program consultants, researchers, program evaluators, and in other roles that require leadership in the areas of counseling, human services, family development, and community organizations. Potential employment settings include institutions of higher education, schools, hospitals, employee assistance programs, substance abuse treatment centers, community mental health agencies, and private practice centers.

The Ph.D. in Counselor Education and Supervision requires a minimum of 63 credit hours beyond those earned in an accredited master's program of at least 48 credit hours. Advance preparation is required in the following areas:

- 1) Implications of ways in which diversity (e.g., race, gender, age, religion, spirituality, ethnicity, mental/physical ability, nationality, and sexual orientation) influence counseling practice and counselor education
- 2) Theories pertaining to the principles and practice of counseling, career development, group work, and consultation
- 3) Clinical skill development in counseling, group work, and consultation
- 4) Theories and practice of counselor supervision
- 5) Design and implementation of quantitative research and methodology
- 6) Design and implementation of qualitative research and methodology
- 7) Models and methods of assessment and use of data
- 8) Ethical and legal considerations in counselor education and supervision
- 9) Instructional theory and methods relevant to counselor education

In addition to a 100-hour clinically based doctoral practicum, doctoral students participate in internship experiences of at least 600 clock hours that include teaching, supervision, and research.

Students also collaborate with faculty as a part of their Professional Development Plan in teaching, supervision, counseling services, research, professional writing, and service to the community, region, and profession.

Program Objectives

- 1) To acquire, integrate, and apply empirical and theoretical knowledge of the field of counseling
- 2) To develop leadership and advocacy skills in counselor education, supervision, advanced counseling practice, and research
- 3) To apply advanced skills and competencies in field-based settings
- 4) To conduct research and generate new knowledge in counseling
- 5) To design, adapt, and evaluate curricula in the field of counseling
- 6) To develop depth and breadth in professional growth and continued life-long learning
- 7) To examine the influence of social context and policy variables on human behavior
- 8) To show increased sensitivity and clinical skills that demonstrate awareness of the diversity of race, gender, age, religion, ethnicity, mental/physical ability, nationality, and sexual orientation as relevant to counseling professionals

Admission Requirements

Applicants should possess a CACREP-approved Master's Degree in counseling with a cumulative GPA of 3.5 (on a scale of 4.0) or higher. Students with master's degrees

requiring less than 60 credit hours or degrees from non-CACREP-approved Master's programs may need to complete prerequisite courses. All doctoral students accepted into the program who graduated from a CACREP accredited program prior to 2009 or who graduated from a non-CACREP accredited program must provide documentation of a graduate level substance abuse/addiction course or add a substance abuse/addiction course to their program of study. At least one year of experience as a professional counselor is preferred.

Degree Requirements

The Ph.D. in Counselor Education and Supervision requires 63 credit hours of coursework, including the dissertation. If students add the optional Concentration in Play Therapy, their program becomes 69 credit hours.

Core Courses (21 credit hours)

CSLG 8100 - Advanced Theories of Counseling (3)
 CSLG 8105 - Introduction to Counselor Education and Supervision (3)
 CSLG 8110 - Clinical Supervision in Counseling (3)
 CSLG 8203 - Instructional Theory in Counselor Education (3)
 CSLG 8345 - Advanced Multicultural Counseling (3)
 CSLG 8346 - Applied Multicultural Counseling (3)
 CSLG 8998 - Seminar in Prospectus Design (3)

Clinical Courses (12 credit hours)

CSLG 8431 - Doctoral Practicum in Counseling (3)
 CSLG 8440 - Doctoral Internship: Counseling (3)
 CSLG 8442 - Doctoral Internship: Supervision (3)
 CSLG 8445 - Doctoral Internship: Teaching (3)

Research Courses (24 credit hours)

RSCH 8110 - Descriptive and Inferential Statistics (3)
 RSCH 8111 - Qualitative Research Methods (3)
 RSCH 8120 - Advanced Statistics (3)
 RSCH 8140 - Multivariate Statistics (3)
 RSCH 8210 - Applied Research Methods (3)
 CSLG 8999 - Dissertation (1-9) (minimum of 9 credit hours)

Elective Courses (6 credit hours)

Select a minimum of two of the following:

CSLG 7000-8999 - Counseling Elective (3)
 RSCH 7000-8999 - Research Elective (3)

Notes:

- *Courses outside the above list must have approval of the student's Doctoral Advisory Committee and an Academic Petition must be submitted requesting the change.*
- *GRAD 8990, required for all doctoral students, is satisfied by RSCH 8210.*

Play Therapy Concentration (Optional) (12 credit hours)

Concentration Required Courses (9 credit hours)

CSLG 7142 - Introduction to Play Therapy (3)

Plus two of the following:

CSLG 7143 - Filial Therapy: An Approach to Parent Training (3)
 CSLG 7144 - Contemporary Theories of Play Therapy (3)
 CSLG 7147 - Multicultural and Social Justice Issues in Play Therapy (3)

Concentration Elective Course (3 credit hours)

Select one of the following:

CSLG 7145 - Special Topics in Play Therapy (3)
 Remaining course not taken above (CSLG 7143, CSLG 7144, or CSLG 7147)
 Other course approved by the Director of the Play Therapy concentration

Degree Total = 63 Credit Hours

Admission to Candidacy

Students are considered candidates for the doctoral degree on successful completion of the Comprehensive Examination and acceptance of the Dissertation Proposal.

Advising

Students select a program advisor and committee by the end of their first fall semester in the program. The program advisors assist students during the initial stages of the program, which includes developing a Program of Study aligned with the program plan in DegreeWorks for the catalog year in which the student entered the program, developing a Professional Development Plan, and identifying faculty whose research interests and expertise are congruent with students' areas of inquiry for the dissertation. The assistance of the advisor does not relieve students of responsibility for following departmental and University procedures. Following the comprehensive exam, students select a dissertation advisor/chair and committee. The program advisors continue to provide academic advisement to students through their program, regardless of whether they are part of students' dissertation committee.

Comprehensive Exam

The main objective of the written portion of the qualifying exam is to ensure that the student is adequately prepared to write a dissertation to complete the Ph.D. degree requirements. Being prepared means the following:

- 1) Examinees must have completed all degree core content courses.
- 2) Examinees must be able to analyze and synthesize information obtained from coursework and research within a multicultural counseling context.

- 3) Examinees must demonstrate advanced knowledge in the core areas of counselor education.
- 4) Examinees must demonstrate competencies in research methodology and evaluation.

The comprehensive exam is a 2-day written exam administered on campus.

Dissertation

Each candidate for the doctoral degree is required to prepare and present a dissertation that shows independent investigation and is acceptable in form and content to the Dissertation Committee. A doctoral dissertation must demonstrate the candidate's ability to conceive, design, conduct, and interpret independent, original, and creative research and must make a unique contribution to knowledge in the field of counseling. Under the direct supervision of the Doctoral Committee Chair, students are encouraged to consult regularly with their Dissertation Committee members during the planning, conducting and writing of the dissertation. Following the approval of the dissertation proposal students are required to maintain continuous enrollment (fall and spring semesters) for dissertation study until work is completed. Continuous enrollment begins on the date the Graduate School approves the student's dissertation topic. Students who exceed the required number of dissertation hours for degree completion will register for GRAD 9999 each semester until degree requirements have been completed.

Dissertation Committee

A Dissertation Committee, comprised of at least five faculty members, will be formally appointed for each student after admission to candidacy. At least three committee members must be on the Counseling Program faculty and one member will be appointed by the Graduate School. A person outside the University may serve as a full member of the Dissertation Committee in situations where knowledge or expertise of a particular nature is desired. With the mutual consent of the student and the faculty member, a faculty member will be designated to serve as the Chair of the Doctoral Committee. Chairs of Doctoral Committees are specifically responsible for seeing that the student progresses in an expeditious manner towards completion of the degree. Chairs will assist students in organizing committee meetings, conducting original research, presenting the proposal, and organizing the dissertation defense. Eligible faculty are all tenured faculty (Professor/Associate Professor), as well as Assistant Professors who have been reappointed for their second term. Each appointed Committee Member will have both voice and vote on all relevant matters pertaining to a doctoral student's progress towards the degree. At least four committee members must be present for the oral defense of the dissertation. The oral defense is considered satisfactory upon the positive vote of at least four

committee members. Prior to and following the appointment of this committee, students are encouraged to work with faculty on dissertation ideas.

Internships

Doctoral students are required to complete a total of 600 clock hours of internship in the areas of teaching, supervision, and research. Students and their doctoral advisors develop collaboratively components of their internship experiences in accordance with relevant CACREP standards.

Practicum

A Doctoral Practicum is taken in the first year of study. The practicum requires 100 hours over the course of a semester at an approved site in the community. The Practicum involves the acquisition of new skills and learning regardless of the site selected.

M.A. in Counseling

The Master of Arts in Counseling offers concentrations in School Counseling, Clinical Mental Health Counseling, and Addiction Counseling. In addition, the program offers an additional secondary Play Therapy concentration.

All concentrations qualify graduates to become a Licensed Clinical Mental Health Counselor Associate (LCMHC) in the state of North Carolina. Graduates can also apply for credentialing as an Nationally Certified Counselor (NCC) through the National Board of Certified Counselors.

The School Counseling concentration qualifies graduates for advanced-level K-12 school counseling licensure in North Carolina. Those completing the Addiction concentration can apply to become certificated as a Licensed Clinical Addiction Specialist (LCAS) through the NC Substance Abuse Professional Practice Board. The Play Therapy concentration meets the educational requirements, as specified by the Association for Play Therapy (APT), for the Registered Play Therapist (RPT) credential, is recognition of academic achievement, and enhances professional standing.

Program Objectives

As prospective professional counselors, graduates of the program are prepared to: counsel clients, both individually and in groups, on educational, career, life planning, social, emotional, physical, spiritual, and organizational concerns; provide information to clients for educational, social, career, and/or life planning; consult with other professionals concerning client needs; and conduct needs assessments, evaluations, and other activities for program design.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the criteria for admission to the M.A. in Counseling program include an applicant's potential success in forming effective interpersonal relationships in individual and small-group contexts; aptitude for graduate-level study; career goals and objectives; openness to self-examination; and potential for personal and professional self-development. Students are not required to have an undergraduate major in any particular field to enter the counseling program. Admission decisions are based on applicants' individual profiles and made by a committee of program faculty. Applicants with the highest profile rankings are invited to campus for an interview process; the number invited is determined by the number of anticipated openings in the program. Students are admitted to the program in the Spring of each year, and they are expected to begin their studies the following Summer or Fall semester. The application deadline for each year's admissions process is December 1.

Degree Requirements

The M.A. in Counseling program requires a total of 60 credit hours, including core courses for all students and specialization courses for students in School Counseling, Clinical Mental Health Counseling, or Addiction. In addition, the program offers an additional secondary Play Therapy concentration. Each concentration includes a series of required courses, clinical experience courses, and elective courses.

Core Courses for All Students (30 credit hours)

CSLG 6100 - Counseling Theories (3)
 CSLG 6101 - Ethical and Professional Issues in Counseling (3)
 CSLG 6104 - Counseling Across the Lifespan (3)
 CSLG 6110 - Counseling Techniques (3)
 CSLG 6111 - Advanced Counseling Techniques (3)
 CSLG 6120 - Group Counseling (3)
 CSLG 6145 - Multicultural Counseling (3)
 CSLG 6150 - Career Development and Counseling (3)
 CSLG 7110 - Individual Assessment (3)
 RSCH 6101 - Research Methods (3)

Concentrations (30 credit hours)

Addiction Concentration

Addiction Courses (18 credit hours)

CSLG 6160 - Theories of Addiction (3)
 CSLG 6161 - Assessment and Diagnosis of Addictive Disorders (3)
 CSLG 6162 - Interventions in Addiction Counseling (3)
 CSLG 6164 - The McLeod Institute on Addiction (3)
 CSLG 7170 - Introduction to Clinical Mental Health Counseling (3)

Clinical Experiences (Addiction Setting) (9 credit hours)

CSLG 7430 - Practicum in Counseling (3) (150 hours)

CSLG 7435 - Internship in Counseling (3) (300 hours) (*taken twice*)

Elective Course (3 credit hours)

The elective course must be approved by the student's advisor.

Clinical Mental Health Concentration

Clinical Mental Health Courses (9 credit hours)

CSLG 7170 - Introduction to Clinical Mental Health Counseling (3)
 CSLG 6153 - Diagnosis and Treatment in Counseling (3)

Plus one Addiction course from the following:

CSLG 6000 - Topics in Counseling (1 to 6) (*McLeod Institute*)
 CSLG 6160 - Theories of Addiction (3)
 CSLG 6161 - Assessment and Diagnosis of Addictive Disorders (3)
 CSLG 6162 - Interventions in Addiction Counseling (3)
 CSLG 6163 - Treatment Planning and Relapse Prevention in Addiction Counseling (3)
 CSLG 6164 - The McLeod Institute on Addiction (3)

Clinical Experiences (Clinical Mental Health Setting) (9 credit hours)

CSLG 7430 - Practicum in Counseling (3) (150 hours)
 CSLG 7435 - Internship in Counseling (3) (300 hours) (*taken twice*)

Elective Courses (12 credit hours)

These courses must be approved by the student's advisor.

School Counseling Concentration

School Counseling Courses (9 credit hours)

CSLG 7140 - Consultation in School Counseling (3)
 CSLG 7141 - The Professional School Counselor (3)
 CSLG 7646 - Advocacy and Leadership in Professional School Counseling (3)

Clinical Experiences (School Setting) (9 credit hours)

CSLG 7430 - Practicum in Counseling (3) (150 hours)
 CSLG 7435 - Internship in Counseling (3) (300 hours) (*taken twice*)

Elective Courses (12 credit hours)

These courses must be approved by the student's advisor.

Secondary Concentration (*Optional*) (12 credit hours) Play Therapy Concentration

The Concentration in Play Therapy consists of a coherent program of play therapy coursework of 4 courses (12 credit hours). The concentration is an add-on, secondary concentration for students in the counseling programs. Students may add this secondary concentration to their primary concentration (Addiction, Clinical Mental Health, or School Counseling) by completing an Academic

Petition.

Required Courses (9 credit hours)

CSLG 7142 - Introduction to Play Therapy (3)

Plus two of the following:

CSLG 7143 - Filial Therapy: An Approach to Parent Training (3)

CSLG 7144 - Contemporary Theories of Play Therapy (3)

CSLG 7147 - Multicultural and Social Justice Issues in Play Therapy (3)

Elective Course (3 credit hours)

Select one of the following:

CSLG 7145 - Special Topics in Play Therapy (3)

Remaining course not taken above (CSLG 7143, CSLG 7144, or CSLG 7147)

Other course approved by the Director of the Play Therapy concentration

Degree Total = 60 Credit Hours

Comprehensive Exam

Students must successfully pass the Counselor Preparation Comprehensive Exam (CPCE) to graduate from the program. Students are expected to consult with their advisors during the first 24 hours of coursework concerning procedures and preparation for this experience.

Advising

All students should plan their program of study by December of their first year of study with their advisors.

Licensure

Students who graduate from the School Counseling concentration are eligible, upon passing the exam required by the North Carolina Department of Public Instruction (DPI), to be recommended for school counseling licensure from the North Carolina DPI. All graduates are eligible to apply for the credential of Licensed Clinical Mental Health Counselor Associate (LCMHC-A) through the NCLCMHC upon completion of the application and required exam prior to July 1, 2025, and until July 1, 2027 if LCMHC-A application is submitted by July 1, 2025. After this date, students who graduate from the School Counseling concentration must complete additional coursework to pursue the LCMHC-A license. They are encouraged to meet with their faculty advisors for guidance.

Post-Master's Certificate in Addiction Counseling

The Post-Master's Certificate in Addiction Counseling is designed to prepare students to assist those in need of counseling due to addiction.

Admission Requirements

This certificate program admits practitioners who hold a master's degree in counseling from a CACREP-accredited graduate degree program. In addition to the general requirements for admission to a certificate program, applicants must provide official transcripts, three letters of recommendation from persons familiar with the applicant's personal and professional qualifications, and an essay describing the applicant's relevant experience and objectives in undertaking the Post-Master's Certificate in Addiction Counseling program.

Applications for admission to the certificate program are considered as they are received and admissions are ongoing. Students are admitted to the Graduate School in a special category for certificate students.

Certificate Requirements

Required Courses (9 credit hours)

CSLG 6160 - Theories of Addiction (3)

or CSLG 8160 - Theories of Addiction (3)

CSLG 6161 - Assessment and Diagnosis of Addictive Disorders (3)

or CSLG 8161 - Assessment and Diagnosis of Addictive Disorders (3)

CSLG 6162 - Interventions in Addiction Counseling (3)

or CSLG 8162 - Interventions in Addiction Counseling (3)

Elective Course (3 credit hours)

Select one of the following:

CSLG 6163 - Treatment Planning and Relapse Prevention in Addiction Counseling (3)

or CSLG 8163 - Treatment Planning and Relapse Prevention in Addiction Counseling (3)

CSLG 6164 - The McLeod Institute on Addiction (3)

CSLG 8164 - The McLeod Institute on Addiction (3)

Field Experience Requirement (3 credit hours)

300 hours of supervised field experiences in substance use disorder treatment is required. *Select one of the following:*

CSLG 7435 - Internship in Counseling (3)

CSLG 8440 - Doctoral Internship: Counseling (3)

Certificate Total = 15 Credit Hours

Graduate Certificate in Play Therapy

The Graduate Certificate in Play Therapy program is designed to prepare students to work with children who are 10 years and younger in a developmentally appropriate way in both school counseling and community settings. It is available for students who have completed a master's degree in counseling, social work, or psychology and want additional training in play therapy. In addition, the program is available for students in other departments at UNC Charlotte and students at other universities in their M.A. and Ph.D. programs.

The Graduate Certificate in Play Therapy meets the educational requirements as specified by the Association for Play Therapy (APT) for the Registered Play Therapist (RPT) credential. The Graduate Certificate is recognition of academic achievement and enhances professional standing.

Admission Requirements

- 1) An earned master's degree in counseling, social work, or psychology from a college or university accredited by an accepted accrediting body
- 2) Online application to Graduate Admissions accompanied by the application fee in effect
- 3) GPA required for entry into a master's degree program
- 4) Official transcripts
- 5) Personal statement of interest

The program adheres to Graduate School Admissions deadlines. Please note that classes may fill before the Graduate School's final deadlines. Students are admitted to the Graduate School in a special category for Graduate Certificate students and must comply with all policies and regulations of the Graduate School from the time they are admitted until they graduate.

Certificate Requirements

Core Course (3 credit hours)

CSLG 7142 - Introduction to Play Therapy (3)

Elective Courses (9 credit hours)

Select two of the following:

CSLG 7143 - Child-Centered Relationship Training: An Approach for Parents/Caregivers/Teachers (3)
 CSLG 7144 - Contemporary Theories of Play Therapy (3)
 CSLG 7147 - Multicultural and Social Justice Issues in Play Therapy (3)

Plus one of the following:

CSLG 7145 - Special Topics in Play Therapy (3)
 The remaining Elective Course not taken above

Other course approved by the Graduate Program Director of the Graduate Certificate in Play Therapy

Certificate Total = 12 Credit Hours

Post-Master's Certificate in School Counseling

The Post-Master's Certificate in School Counseling provides graduate level coursework related to school counseling. Successful completion of the program requirements enables the counselor to be recommended for licensure in school counseling from the North Carolina Department of Public Instruction. A minimum of 12 credit hours is required for the post-master's certificate. All coursework applied to a certificate must be completed within five years. Transfer credit is not accepted into the certificate program.

This program has been designed for counselors who want to become eligible for licensure as school counselors by the Department of Public Instruction in North Carolina. The completion of this program, in addition to passing the PRAXIS II Specialty Area Test for School Counselors, qualifies students to become licensed School Counselors. In addition to the required courses, an additional internship may be required should the student need further clinical training. Any additional coursework is based on the individual review of each applicant's graduate transcript(s) and selected program option.

The certificate program is available online through Distance Education only for those applicants from CACREP-approved programs who qualify for CAS-level licensure [Options A and B]. Visit distanceed.charlotte.edu for additional information.

Admission Requirements

- 1) A master's degree in counseling from a college or university accredited by an accepted accrediting body in Agency Counseling, Clinical Mental Health Counseling, Community Counseling, or Rehabilitation Counseling
- 2) Written application to Graduate Admissions accompanied by the application fee in effect
- 3) A Statement of Purpose
- 4) Letter(s) of Recommendation
- 5) Official transcripts (undergraduate/graduate)

Candidates wishing to begin in Summer or Fall semesters must submit their application by March 1 to the Graduate School.

Certificate Requirements**Program Options*****Option A***

For counselors who graduated from a 60 credit CACREP accredited program in Agency Counseling, Clinical Mental Health Counseling, Community Counseling, or Rehabilitation Counseling.

Based on a review of the applicant's transcript, a program of study is designed that indicates the counselor has completed the below Course Requirements.

Upon successful completion of Option A and a passing score on the PRAXIS II test, candidates are eligible for CAS-level Licensure in School Counseling.

Option B

For counselors who graduated from CACREP accredited programs in Agency Counseling, Clinical Mental Health Counseling, Community Counseling, or Rehabilitation Counseling with less than 60 credit hours.

Based on a review of applicant's transcript, a program of study is designed that is equivalent to a 60 credit school counseling program, including the below Course Requirements.

Upon successful completion of Option B and a passing score on the PRAXIS II test, candidates are eligible for CAS-level Licensure in School Counseling.

Option C

For counselors who graduated from non-accredited counseling programs in Agency Counseling, Clinical Mental Health Counseling, Community Counseling, or Rehabilitation Counseling.

Based on a review of applicant's transcript, a program of study is designed that is equivalent to a 48 credit school counseling program, including the below Course Requirements.

Candidates successfully completing Option C and passing the PRAXIS II test are eligible for M-level Licensure.

Required Courses (12 credit hours)

CSLG 7140 - Consultation in School Counseling (3)
 CSLG 7141 - The Professional School Counselor (3)
 CSLG 7436 - Advanced Internship in School Counseling (3)
 CSLG 7646 - Administration and Leadership of School Counseling Services (3)

Certificate Total = 12 Credit Hours**Additional Program Requirements and Information**

In addition to completing required courses, students must pass the PRAXIS II Specialty Area Test for School

Counseling to qualify for state licensure. Registration and information are available at ets.org.

Upon completion of all coursework and passing the PRAXIS II, candidates are admitted to candidacy and must apply for graduation at the start of their last semester. Candidates must also make application for their school counseling license a month prior to program completion in the TEAL Office.

CURRICULUM AND INSTRUCTION/ MIDDLE GRADES AND SECONDARY EDUCATION

- **Ph.D. in Curriculum and Instruction**
 - Curriculum and Educator Development (CED)
 - Learning, Design, and Technology (LDT)
 - Literacy Education
 - Mathematics Education
 - Urban Education
- **M.Ed. in Curriculum and Instruction**
 - Elementary Education
 - Curriculum Leadership
 - Middle Grades Education
 - Secondary Education
 - Teaching English as a Second Language
- **Master of Arts in Teaching (M.A.T.) - Middle Grades and Secondary Education**
 - Middle Grades Education
 - Secondary Education
- **Graduate Certificate in Teaching – Middle Grades and Secondary Education**
 - Middle Grades English Language Arts
 - Middle Grades Mathematics
 - Middle Grades Science
 - Middle Grades Social Studies
 - Secondary English Language Arts
 - Secondary Mathematics
 - Secondary Science
 - Secondary Social Studies
 - Career and Technical Education Business
 - Career and Technical Education Family and Consumer Sciences
 - Career and Technical Education Marketing
 - Career and Technical Education Technology
- **Graduate Certificate in Teaching – Art Education**

Department of Middle, Secondary, and K-12
Education

mdsk.charlotte.edu

Ph.D. in Curriculum and Instruction

The Ph.D. in Curriculum and Instruction is designed to prepare teacher education faculty and other educational professionals for work in various agency and educational settings. The program is interdisciplinary and involves faculty from across the University campus, and primarily the Departments of English; Mathematics and Statistics; Middle, Secondary, and K-12 Education; Reading and Elementary Education; and Educational Leadership. The program focuses on urban education issues and perspectives related to curriculum and instruction with concentrations in:

- Curriculum and Educator Development (CED) (includes Elementary Education)
- Learning, Design, and Technology (LDT)
- Literacy Education (oriented toward Reading Education, English Education, or Teaching English as a Second Language)
- Literacy Research, Policy, & Practice (LRPP)
- Mathematics Education
- Urban Education

Studies include a substantive core in urban education and educational research. Urban education research emphasizes explore innovative strategies and practices to enhance learning in the diverse and resource-rich environments of cities, focusing on creating equitable educational opportunities for all students. It aims to understand and leverage the unique advantages of urban settings, such as cultural richness and community partnerships, to support student achievement and development.

Doctoral students may focus their study on education for learners at elementary, middle grades, secondary, K-12, or post-secondary/adult levels.

Each concentration in the Ph.D. in Curriculum and Instruction offers UNC Charlotte graduate students and alumni the opportunity to apply for Advanced Standing. For more information, see Advanced Standing below.

Curriculum Objectives

- Lead inquiry into the nature of curriculum theory and the relationship that theory has upon the major sources, components, and processes required in curriculum development, particularly within expanding urban-regional environments.
- Demonstrate relationships among curriculum theory and design, models of and research about teaching and learning, variations among learners, and the

ideological, social, and disciplinary contexts of teaching and learning, including the influence on urban-regional schools, state and national policies, curriculum philosophy, and political pressures.

- Guide curriculum development and evaluation in its pragmatic context by applying curriculum theory, research, policy, and practice for diverse learners within a variety of educational settings.
- Identify, seek solutions, and overcome the obstacles that may impede the educational success of students in urban areas while also drawing upon the assets of diverse learners and leveraging the strengths and opportunities that urban communities offer, such as access to cultural institutions, businesses, and organizations that can enrich the educational experience of all learners.

Research and Evaluation Objectives

- Use appropriate quantitative and qualitative research methods to identify and solve problems in urban education and related disciplines, detect new patterns, and assess the effectiveness of curriculum, instructional programs, and teaching methodologies for all learners.
- Use appropriate critical quantitative and qualitative research methods to identify assets, agency, and resilience in urban education and related disciplines, conduct transformative research, and engage educational communities in evaluating the effectiveness of curriculum, instructional programs, and teaching methodologies for all learners.
- Communicate research and evaluation findings in a variety of written and electronic formats, such as evaluation reports, professional articles, grant proposals, conference presentations, and technical reports, with the consistent underlying purpose of supporting educational effectiveness, expanding and sustaining equitable and inclusive environments within a variety of educational settings, and reform in urban-regional environments.

Specialty Objectives

- Use appropriate quantitative and qualitative research methods to identify and solve problems in urban education and related disciplines, detect new patterns, and assess the effectiveness of curriculum, instructional programs, and teaching methodologies for all learners.
- Use appropriate critical quantitative and qualitative research methods to identify assets, agency, and resilience in urban education and related disciplines, conduct transformative research, and engage educational communities in evaluating the effectiveness of curriculum, instructional programs, and teaching methodologies for all learners.
- Communicate research and evaluation findings in a variety of written and electronic formats, such as

evaluation reports, professional articles, grant proposals, conference presentations, and technical reports, with the consistent underlying purpose of supporting educational effectiveness, expanding and sustaining equitable and inclusive environments within a variety of educational settings, and reform in urban-regional environments.

Admission Requirements

Applicants should submit a current vitae, statement of purpose, a professional writing sample, and a minimum of three reference letters. A review committee will conduct an initial review of application materials and recommend selected applicants for on-campus or online interviews. The selection committee will then make final recommendations to the Graduate School relative to acceptance into the program based on the merits of the application materials and the interview process.

Prerequisite Requirements

The intended audience for the Ph.D. in Curriculum and Instruction includes education professionals who hold the master's degree. It is anticipated that most applicants will be experienced teachers or school leaders with the North Carolina "G" or "M" license or equivalent licenses from other states. However, the program will welcome and accommodate non-licensed candidates with appropriate professional experiences who have been involved in teaching or educational program development and evaluation.

Degree Requirements

The Ph.D. in Curriculum and Instruction requires a minimum of 60 credit hours of coursework, including the dissertation. Students must maintain a cumulative average of 3.0 in all coursework taken. An accumulation of more than two C grades will result in termination of enrollment in the graduate program. If students make a grade of U in any course, enrollment in the program will be terminated.

The program will consider the transfer of a limited number of courses from a college or university accredited by an accepted accrediting body (typically no more than six credit hours), providing the Curriculum and Instruction Committee determines that the course or courses to be transferred are appropriate for the program of study and are graduate-level courses beyond the master's degree. Grades for these transfer courses must be an A or B. All dissertation work must be completed at UNC Charlotte.

Students must successfully complete requirements for the comprehensive examination and dissertation. All students must complete a residency requirement of at least 18 credit hours over three successive terms of enrollment. Students must complete their degree, including dissertation, within nine years. The Ph.D. website (mdsk.charlotte.edu/academic-programs/phd-ci) contains

additional information, including updated planning sheets for each concentration.

Foundation Course (3 credit hours)

The program requires all students in each concentration, including Advanced Standing, complete in the first year a pro-seminar in curriculum, instruction, and urban education leadership.

EDCI 8620 - Pro-Seminar in Curriculum, Instruction, and Urban Education Leadership (3)

Urban Core Courses (12-15 credit hours)

Each concentration requires core coursework in Urban Foundations. The Urban Education concentration requires 15 credit hours. Mathematics Education; Literacy Education; Curriculum and Educator Development (CED); and Learning, Design, and Technology (LDT) concentrations require 12 credit hours.

EDCI 8180 - Critical Issues and Perspectives in Urban Education (3)

EDCI 8182 - Power, Privilege, and Education (3)

EDCI 8184 - Social Theory and Education (3)

EDCI 8186 - Globalization, Urbanization, and Urban Schools (3)

EDCI 8314 - Urban Educational Reform (3) (*required only for Urban concentration*)

Research Methodology Courses (15 credit hours)

Each concentration must also complete at least 15 credit hours of research coursework, which also count toward dissertation preparation hours. Please note that five courses are required but not necessarily sufficient. Additional courses not listed require Graduate Program Director approval.

Required Courses

RSCH 8110 - Descriptive and Inferential Statistics (3)

RSCH 8210 - Applied Research Methods (3)

Elective Courses

Select three or more of the following:

EDCI 8121 - Applied Research Methods in the Teaching of English (3)

EDCI 8250 - Literacy and Language Development (3)

RSCH 8111 - Qualitative Research Methods (3)

RSCH 8112 - Survey Research Methods (3)

RSCH 8113 - Single-Case Research (3)

RSCH 8120 - Advanced Statistics (3)

RSCH 8121 - Qualitative Data Collection and Analysis (3)

RSCH 8131 - Interviewing as Qualitative Inquiry (3)

RSCH 8140 - Multivariate Statistics (3)

RSCH 8150 - Structural Equation Modeling (3)

RSCH 8160 - Hierarchical Linear Models in Education (3)

RSCH 8196 - Program Evaluation Methods (3)

RSCH 8197 - Design and Analysis of Experimental and Quasi-Experimental Evaluations (3)

RSCH 8220 - Educational and Psychological Measurement (3)

RSCH 8230 - Theory and Applications of Measurement (3)

RSCH 8890 - Special Topics in Research (3)

Concentration Courses (18-21 credit hours)

There are six concentrations available within the Ph.D. in Curriculum and Instruction program:

- 1) Curriculum and Educator Development (CED)
- 2) Learning, Design, and Technology (LDT)
- 3) Literacy Education (oriented toward Reading Education, English Education, or Teaching English as a Second Language)
- 4) Literacy Research, Policy & Practice
- 5) Mathematics Education
- 6) Urban Education

Each of the available concentrations offers a variety of required and concentration-specific course offerings at the doctoral level. Each concentration must also complete specialization coursework specific to the concentration.

Curriculum and Educator Development (CED)

Concentration (21 credit hours)

This concentration focuses on and emphasizes the context of urban education assets, issues and perspectives related to curriculum and instruction through the study of research and theory applied to problems and applications of curriculum, instruction, learning, teaching, teacher education, professional development, and teacher leadership in K-12 and higher education. Emphases within the concentration include Elementary Education, Middle Grades and/or Secondary Education, K-12 Curriculum Specialization, Curriculum and Professional Development.

Required Courses (18 credit hours)

ADMN 8130 - Educational Governance and Policy Studies (3)

ADMN 8160 - Introduction to Educational Administration (3)

EDCI 8156 - Critical Issues in K-12 Curriculum and Instruction (3)

EDCI 8157 - Analysis of Inquiry in Curriculum, Instruction, and Educator Development (3)

EDCI 8158 - Research in Curriculum, Instruction, and Educator Development (3)

EDCI 8475 - College Co-Teaching Internship in Curriculum and Instruction (3)

EDCI 8650 - Scholarly Readings and Research in Curriculum, Instruction, and Educator Development (3)

EDCI 8681 - Seminar in College Teaching (3)

Elective Courses (3 credit hours)

Select from the following, in consultation with the Program Advisor. Students may enroll in graduate-level credit outside of this list with approval of the Program Advisor.

- EDCI 8070 - Topics in Urban Educational Leadership (3)
- EDCI 8080 - Topics in Curriculum, Instruction and Educator Development (3)
- EDCI 8084 - Topics and Research in Social Studies Education (3)
- EDCI 8113 - Research in Mathematics Education (3)
- EDCI 8120 - Perspectives in Literacy Research, Policy, and Practice (3)
- EDCI 8129 - Linguistics and Language Learning (3)
- EDCI 8133 - Multiculturalism and Children's Literature (3)
- EDCI 8153 - Pro-Seminar in Elementary Education (3)
- EDCI 8225 - Topics and Issues in Middle Grades Education (3)
- EDCI 8314 - Urban Educational Reform (3)
- EDCI 8462 - Supervision of Student Teachers (3)
- EDCI 8485 - College Teaching and Professional Development Internship (3)
- EDCI 8655 - Seminar on Practice-Based Teacher Education and the Science of Learning (3)
- EDCI 8682 - Seminar in Professional and Grant Writing (3)
- EDCI 8850 - Independent Study in Curriculum and Educator Development (3)
- GRAD 8210 - Graduate-Level Writing for International Students (3)
- GRAD 8212 - Academic Writing (3)
- GRAD 8610 - Making Dissertations Happen: Managing Writing and Life (3)
- PPOL 8689 - The Social Context of Schooling (3)

Learning, Design and Technology (LDT) Concentration (21 credit hours)

The Learning, Design and Technology concentration will focus on research and theory in the design of effective learning experiences and environments that incorporate technology to address educational needs and problems in elementary, middle/secondary, or post-secondary settings with an emphasis on urban contexts. The program will prepare graduates who wish to work as researchers and university faculty in higher education or other professional organizations addressing important societal problems in Learning, Design and Technology.

Required Courses (6 credit hours)

- ADMN 8695 - Advanced Seminar in Teaching and Learning (3)
- ELDT 8102 - Research in Learning, Design, and Technology (3)

Elective Courses (15 credit hours)

Select from the following, in consultation with the Program Advisor. Students may enroll in graduate-level credit outside of this list with approval of the Program Advisor.

- ELDT 8000 - Topics in Learning, Design, and Technology (1 to 6)
- ELDT 8100 - Foundations of Learning, Design, and Technology (3)
- ELDT 8110 - Instructional Design (3)
- ELDT 8120 - Current Trends in Learning, Design, and Technology (3)
- ELDT 8121 - Advanced Instructional Design (3)
- ELDT 8130 - Instructional Multimedia Development (3)
- ELDT 8135 - Learning Media, Resources and Technology (3)
- ELDT 8140 - Instructional Video Development (3)
- ELDT 8150 - Design, Development, and Evaluation of Online Learning Systems (3)
- ELDT 8160 - Designing Learning Systems with Simulation and Game Technology (3)
- ELDT 8170 - Human Performance Technology (3)
- ELDT 8800 - Individual Study in Learning, Design, and Technology (1 to 6)
- EDCI 8681 - Seminar in College Teaching (3)
- GRAD 8210 - Graduate-Level Writing for International Students (3)
- GRAD 8212 - Academic Writing (3)
- GRAD 8610 - Making Dissertations Happen: Managing Writing and Life (3)

Literacy Education Concentration (21 credit hours)

The Literacy Education Concentration is an interdisciplinary collaboration between Reading Education, English Education, Teaching English as a Second Language, Foreign Language and Multilingual Education encompassing dimensions of language, culture, and literacies broadly defined as they relate to urban education. The Literacy Education Concentration uses an apprenticeship model of teaching and learning, meaning that students are encouraged to work closely with faculty whose research interests, methodological approaches, and theoretical frameworks align with their own.

Literacy Education Concentration Electives (21 credit hours)

Select seven courses from the following. Concentration Coordinator consultation is required to enroll in the below courses. Students may enroll in graduate-level credit outside of the below list with approval of the Program Advisor.

- ADMN 8101 - Perspectives on Adult Learning Theory (3)
- EDCI 8040 - Topics in Literacy Education (3)
- EDCI 8070 - Topics in Urban Educational Leadership (3)
- EDCI 8120 - Perspectives in Literacy Research, Policy, and Practice (3)
- EDCI 8129 - Linguistics and Language Learning (3)
- EDCI 8133 - Multiculturalism and Children's Literature (3)
- EDCI 8134 - Early Black American Literature (3)
- EDCI 8139 - Perspectives in African American Literature (3)
- EDCI 8140 - Current Issues and Practices in Literacy Education (3)

EDCI 8183 - Teaching Multilingual Learners (3)
 EDCI 8201 - Perspectives in Immigration and Urban Education (3)
 EDCI 8202 - Ethnographies of Urban Schools, Communities, and Literacies (3)
 EDCI 8206 - Globalization, Communities, and Schools (3)
 EDCI 8252 - K-12 Writing Development and Instruction (3)
 EDCI 8254 - Collaborative Leadership in Literacy Education (3)
 EDCI 8255 - Disciplinary Literacy (3)
 EDCI 8256 - Literacy Assessment and Intervention (3)
 EDCI 8260 - Psychological and Historical Influences on Society (3)
 EDCI 8261 - Human Identity Development (3)
 EDCI 8262 - Social Dynamics and Systems that Educate (3)
 EDCI 8263 - Social Action and Advocacy (3)
 EDCI 8265 - Multiliteracies in a Global World: Reading and Writing Texts in New Times (3)
 EDCI 8462 - Supervision of Student Teachers (3)
 EDCI 8475 - College Co-Teaching Internship in Curriculum and Instruction (3)
 EDCI 8485 - College Teaching and Educator Development Internship (3)
 EDCI 8640 - Readings in Literacy Research (3)
 EDCI 8681 - Seminar in College Teaching (3)
 EDCI 8682 - Seminar in Professional and Grant Writing (3)
 EDCI 8840 - Independent Study in Reading, Language, and Literacy (3)
 ENGL 6008 - Topics in Advanced Technical Communication (3)
 ENGL 6062 - Topics in Rhetoric (3)
 ENGL 6070 - Topics in English (3)
 ENGL 6103 - Introduction to Children's Literature and Culture (3)
 ENGL 6111 - Shakespeare's Comedies and Histories (3)
 ENGL 6112 - Shakespeare's Tragedies (3)
 ENGL 6113 - Milton (3)
 ENGL 6116 - Technical/Professional Writing (3)
 ENGL 6123 - The Augustan Age, 1660-1785 (3)
 ENGL 6125 - The Romantic Era, 1785-1832 (3)
 ENGL 6126 - The Victorian Era, 1832-1900 (3)
 ENGL 6127 - Seminar in Language, Culture, and Society (3)
 ENGL 6141 - American Romanticism (3)
 ENGL 6142 - American Realism and Naturalism (3)
 ENGL 6143 - American Modernism (3)
 ENGL 6144 - Stylistics (3)
 GRAD 8210 - Graduate-Level Writing for International Students (3)
 GRAD 8212 - Academic Writing (3)
 GRAD 8610 - Making Dissertations Happen: Managing Writing and Life (3)
 TESL 6000 - Topics in Teaching English as a Second Language (16)

Literacy Research, Policy & Practice Concentration Electives (21 credit hours)

The Literacy Research, Policy, & Practice concentration focuses on the development of candidates' knowledge of research, theory, policy and practice as it relates to the implementation of effective literacy learning experiences and environments to address educational needs and issues in elementary, middle/secondary, post-secondary, or community settings with an emphasis on urban contexts.

Required Courses (15 credit hours)

EDCI 8040 - Topics in Literacy Education (3)
 EDCI 8041 - Topics in Literacy Research (3)
 EDCI 8120 - Perspectives in Literacy Research, Policy, and Practice (3)
 EDCI 8250 - Literacy and Language Development (3)
 EDCI 8255 - Disciplinary Literacy (3)

Elective Courses (6 credit hours)

Select from the following. Students may enroll in 3 credit hours of graduate-level courses outside of the below list with approval of the Program Advisor.

EDCI 8129 - Linguistics and Language Learning (3)
 EDCI 8183 - Teaching Multilingual Learners (3)
 EDCI 8252 - K-12 Writing Development and Instruction (3)
 EDCI 8256 - Literacy Assessment and Intervention (3)
 EDCI 8475 - College Co-Teaching Internship in Curriculum and Instruction (3)
 EDCI 8485 - College Teaching and Educator Development Internship (3)
 EDCI 8640 - Readings in Literacy Research (3)
 EDCI 8681 - Seminar in College Teaching (3)
 EDCI 8682 - Seminar in Professional and Grant Writing (3)

Mathematics Education Concentration (21 credit hours)

This concentration emphasizes the context of urban education issues and perspectives related to curriculum and instruction in mathematics education with research and theory applied to problems of learning and teaching mathematics. Students focus on elementary, middle/secondary, or post-secondary mathematics education.

Required Courses (15 credit hours)

EDCI 8112 - Theoretical Foundations of Learning Mathematics (3)
 EDCI 8113 - Research in Mathematics Education (3)
 EDCI 8114 - Advanced Topics in Mathematics Education (3)
 EDCI 8115 - Issues in the Teaching of Mathematics (3)
 EDCI 8160 - Readings in Mathematics Education (3)

Elective Course (6 credit hours)

Select from the following. Students may enroll in 3 credit hours of graduate-level courses outside of the below list with approval of the Program Advisor.

EDCI 8004 - Topics in Analysis (3)
 EDCI 8008 - Topics in Geometry and Topology (3)
 EDCI 8010 - Topics in Mathematics Education (3)
 EDCI 8101 - Foundation of Mathematics (3)
 EDCI 8102 - Real Analysis for Mathematics Teachers (3)
 EDCI 8103 - Computer Techniques and Numerical Methods (3)
 EDCI 8106 - Modern Algebra for Mathematics Teachers (3)
 EDCI 8107 - Linear Algebra for Mathematics Teachers (3)
 EDCI 8118 - Non-Euclidean Geometry (3)
 EDCI 8860 - Independent Study in Mathematics Education (3)
 GRAD 8210 - Graduate-Level Writing for International Students (3)
 GRAD 8212 - Academic Writing (3)
 GRAD 8610 - Making Dissertations Happen: Managing Writing and Life (3)

Urban Education Concentration (18 credit hours)

The Urban Education Concentration emphasizes the context of urban education issues and perspectives related to curriculum and instruction through the study of research and theory applied to critical social issues affecting schools and society from a historical, contemporary, and theoretical perspective in a global context.

Urban Education Concentration Electives (18 credit hours)
Select six courses from the following. Students may enroll in 6 credit hours of courses outside of this list with approval of the Program Advisor.

EDCI 8061 - Topics in Urban Educational Research (3)
 EDCI 8070 - Topics in Urban Educational Leadership (3)
 EDCI 8075 - Topics in Urban-Regional Education (3)
 EDCI 8133 - Multiculturalism and Children's Literature (3)
 EDCI 8134 - Early Black American Literature (3)
 EDCI 8139 - Perspectives in African American Literature (3)
 EDCI 8300 - Social Stratification and Urban Schools and Communities (3)
 EDCI 8310 - Transformative Black Education (3)
 EDCI 8311 - Critical Readings in Urban Education Research (3)
 EDCI 8312 - Urban Schooling, Curriculum, and Pedagogy (3)
 EDCI 8320 - Social Deviance, Delinquency, and Education (3)
 EDCI 8330 - History of Urbanization and Its Impact on Schooling (3)
 EDCI 8460 - Internship in Urban Education (3)
 EDCI 8660 - Readings in Urban Educational Research (3)
 EDCI 8682 - Seminar in Professional and Grant Writing (3)
 EDCI 8880 - Independent Study in Urban Education (1 to 3)
 GRAD 8210 - Graduate-Level Writing for International Students (3)
 GRAD 8212 - Academic Writing (3)
 GRAD 8610 - Making Dissertations Happen: Managing

Writing and Life (3)

Dissertation Courses (9 credit hours)

All concentrations must complete 9 credit hours of dissertation coursework.

EDCI 8699 - Dissertation Proposal Seminar (3) *(taken after successful completion of the comprehensive examinations and pre-proposal meeting with committee members)*

EDCI 8999 - Dissertation Research (3) *(minimum of 6 credit hours; taken after the appointment of the dissertation committee and successful completion of the dissertation proposal defense)*

Degree Total = 60 Credit Hours

Advanced Standing Option

The Ph.D. in Curriculum and Instruction offers Charlotte graduate students and alumni of UNC Charlotte the opportunity to apply for Advanced Standing. Advanced Standing recognizes relevant coursework from approved Charlotte master's degrees. Doctoral students accepted with Advanced Standing into the Ph.D. in Curriculum and Instruction complete a minimum of 48 credit hours of coursework, including the dissertation. No transfer credits are allowed for Advanced Standing students. Advanced Standing students must select a concentration in the application process.

Advanced Standing Admission Requirements

To be admitted to Advanced Standing for the Ph.D. in Curriculum and Instruction program, students must meet the admission requirements of the Ph.D. and must have earned a master's degree from UNC Charlotte in a field related to one of the degree concentrations: (1) Curriculum and Educator Development (CED) (including Elementary Education), (2) Learning, Design, and Technology (LDT), (3) Literacy Education (oriented toward Reading Education, English Education, or Teaching English as a Second Language), (4) Literacy Research, Policy & Practice, (5) Mathematics Education, or (6) Urban Education. Only students who have earned a master's degree within the last ten years in one of the approved UNC Charlotte graduate programs will be considered. All other students should apply to the Ph.D. in Curriculum and Instruction program (without the Advanced Standing option).

Approved UNC Charlotte master's degree programs for Advanced Standing in the Ph.D. in Curriculum and Instruction include:

- M.Ed. in Curriculum and Instruction
- M.Ed. in Elementary Education
- M.Ed. in Learning, Design, and Technology
- M.Ed. in Instructional Systems Technology

- M.Ed. in Middle and Secondary Grades
- M.Ed. in Reading Education
- M.Ed. in Teaching English as a Second Language
- M.Ed. in Urban Education
- M.A. in English
- M.A. in Mathematics
- M.S. in Mathematics

Advanced standing students must have a minimum grade of B in master's degree coursework pertinent to the Ph.D. in Curriculum of Instruction. Additionally, students with a cumulative GPA less than 3.5 in their master's degree or 2 or more grades of C are not eligible for Advanced Standing. In this case, students have the option of requesting transfer of credit hours for individual courses with grades of B or above after acceptance into the 60 credit hour Ph.D. in Curriculum and Instruction degree program.

Students who have successfully completed an approved master's degree at Charlotte and meet GPA and grade requirements are eligible to apply for Advanced Standing in the Ph.D. in Curriculum and Instruction.

How to Apply for Advanced Standing

Applications for Advanced Standing are submitted through Charlotte's academic petition process in the first semester in which a student enrolls in the program.

Recommendations for admission to Advanced Standing are made by the Concentration Coordinator with approval of the Program Director. The academic petition for Advanced Standing should be submitted by either the Concentration Coordinator on behalf of the doctoral student or the doctoral student seeking recognition as Advanced Standing. A letter of support from the Concentration Coordinator is required if the academic petition is initiated by the student.

Advanced Standing Degree Requirements

The Ph.D. in Curriculum and Instruction requires a minimum of 60 credit hours of coursework, including the dissertation. The degree requirements for the Advanced Standing are similar to the Ph.D. in Curriculum and Instruction except students complete a minimum of 48 credit hours. No transfer credits are allowed for Advanced Standing students. All Advanced Standing students select a concentration which determines the Advanced Standing program requirements and specialization. All Advanced Standing students must complete the foundations course (EDCI 8620) in the first year of their program.

Advanced Standing students must maintain a cumulative average of 3.0 in all coursework taken. An accumulation of more than two C grades will result in termination of enrollment in the graduate program. If students make a

grade of U in any course, enrollment in the program will be terminated. For Advanced Standing, courses taken at the master's 5000- or 6000-level cannot be repeated at the doctoral 8000-level. In this case, Advanced Standing students should work with concentration advisors to determine appropriate program electives or course substitutions if necessary. All course substitutions require submission of an academic petition and Graduate Program Director approval.

Advanced Standing students must successfully complete requirements for the Qualifying Comprehensive Examination and dissertation. All Advanced Standing students must complete a residency requirement of at least 18 credit hours over three successive terms of enrollment. Advanced Standing students must complete their degree, including dissertation, within nine years. The Ph.D. website at mdsk.charlotte.edu/academic-programs/phd-curriculum-and-instruction/prospective-students contains additional information, including updated planning sheets for each Advanced Standing concentration.

Advanced Standing Foundation Course (3 credit hours)

Advanced Standing students in each concentration complete in the first year a pro-seminar in curriculum, instruction, and urban education leadership.

EDCI 8620 - Pro-Seminar in Curriculum, Instruction, and Urban Education Leadership (3)

Advanced Standing Urban Core Courses (9-15 credit hours)

Like all Ph.D. in Curriculum and Instruction students, Advanced Standing students complete core coursework in Urban Foundations. For Advanced Standing students, the Urban Education concentration requires 15 credit hours. All other concentrations [Curriculum and Educator Development (CED); Learning, Design, and Technology (LDT); Literacy Education; Literacy Research, Policy & Practice, and Mathematics Education] require Advanced Standing students complete 9 credit hours in urban core coursework.

Students who enter the Ph.D. in Curriculum and Instruction as Advanced Standing must take the Qualifying Comprehensive Examination before the end of their fourth semester in the doctoral program. The Curriculum and Instruction Qualifying Comprehensive Examination includes three parts: Urban Core, Research, and Specialization. The first part of the examination, the Urban Core, covers substantive course content and additional readings, research, and research methodologies from the required urban core courses. While not required for all concentrations in Advanced Standing degree, the program recommends students complete EDCI 8186 or an equivalent course at the Master's level to be prepared for

the urban core comprehensive examination. Like all Ph.D. in Curriculum and Instruction students, Advanced Standing students are expected to complete additional readings in urban education to prepare for the Qualifying Comprehensive Examination.

EDCI 8180 - Critical Issues and Perspectives in Urban Education (3)

EDCI 8182 - Power, Privilege, and Education (3)

EDCI 8184 - Social Theory and Education (3)

EDCI 8186 - Globalization, Urbanization, and Urban Schools (3) (required only for Urban concentration; recommended for other concentrations)

EDCI 8314 - Urban Educational Reform (3) (required only for Urban concentration)

Advanced Standing Research Methodology and Dissertation Courses (18-21 credit hours)

Advanced Standing students must complete at least 9-12 credit hours of research methodology coursework and a minimum of 9 credit hours of dissertation preparation.

Advanced Standing Research Methodology Courses (9-12 credit hours)

Advanced Standing students must complete at least 9-12 credit hours of research methodology coursework. For Advanced Standing in the Mathematics Concentration, students are required to complete 9 credit hours of research methodology coursework. All other concentrations [Curriculum and Educator Development (CED); Learning, Design, and Technology (LDT); Literacy Education; and Urban Education] require 12 credit hours in research methodology coursework.

Please note that three to four research methodology courses are required but may not be sufficient. The Program Advisor may recommend additional research courses in preparation for the dissertation. Research courses not listed within program electives require submission of an academic petition and Graduate Program Director approval.

Required Courses (6 credit hours)

Similar to all students in the Ph.D. in Curriculum and Instruction program, Advanced Standing students have two required research methodology courses..

RSCH 8110 - Descriptive and Inferential Statistics (3)

RSCH 8210 - Applied Research Methods (3)

Elective Courses (3-6 credit hours)

With approval of the Concentration Coordinator and Program Advisor, Advanced Standing students select one or two courses (depending on their concentration) from the research methodology elective courses listed for the Ph.D. in Curriculum and Instruction. Research courses should be specific to either quantitative or qualitative research methods, depending on dissertation plans.

EDCI 8121 - Applied Research Methods in the Teaching of English (3)

EDCI 8250 - Literacy and Language Development (3)

RSCH 8111 - Qualitative Research Methods (3)

RSCH 8112 - Survey Research Methods (3)

RSCH 8113 - Single-Case Research (3)

RSCH 8120 - Advanced Statistics (3)

RSCH 8121 - Qualitative Data Collection and Analysis (3)

RSCH 8131 - Interviewing as Qualitative Inquiry (3)

RSCH 8140 - Multivariate Statistics (3)

RSCH 8150 - Structural Equation Modeling (3)

RSCH 8160 - Hierarchical Linear Models in Education (3)

RSCH 8196 - Program Evaluation Methods (3)

RSCH 8197 - Design and Analysis of Experimental and Quasi-Experimental Evaluations (3)

RSCH 8220 - Educational and Psychological Measurement (3)

RSCH 8230 - Theory and Applications of Measurement (3)

RSCH 8890 - Special Topics in Research (3)

Advanced Standing Dissertation Courses (9 credit hours)

EDCI 8699 - Dissertation Proposal Seminar (3) (*taken after successful completion of the comprehensive examinations, appointment of the dissertation committee, and pre-proposal meeting with dissertation committee members*)

EDCI 8999 - Dissertation Research (3) (*minimum of 6 credit hours; taken after the appointment of the dissertation committee and successful completion of the dissertation proposal defense*)

Advanced Standing Concentration Courses (9-18 credit hours)

Advanced Standing students must complete specialization coursework specific to their concentration. There are six concentrations available within the Ph.D. in Curriculum and Instruction program for Advanced Standing students:

- Curriculum and Educator Development (CED) (includes Elementary Education)
- Learning, Design, and Technology (LDT)
- Literacy Education (oriented toward Reading Education, English Education, or Teaching English as a Second Language)
- Mathematics Education
- Urban Education

Each concentration offers a variety of concentration-specific course offerings at the doctoral level which are listed under the concentration requirements and electives for all students in the Ph.D. in Curriculum and Instruction program.

All Advanced Standing students are required to meet with the Concentration Coordinator and Program Advisor for identification of specialization courses. For Advanced Standing, courses taken at the master's 5000 or 6000-

level cannot be repeated at the doctoral 8000-level to meet concentration requirements. Cross-listed courses if completed at the master's 5000 or 6000-level cannot be repeated at the 8000-level to meet concentration requirements. No transfer credit hours are allowed in Advanced Standing.

The number of required credit hours varies by concentration. For Advanced Standing, the Curriculum and Educator Development (CED); Learning, Design, and Technology (LDT); Literacy Education; and Literacy Research, Policy & Practice concentrations require 15 credit hours in specialization coursework for Advanced Standing students. The Urban Education concentration requires Advanced Standing students complete 9 credit hours in their specialization. The Mathematics Education concentration requires Advanced Standing students complete 18 credit hours in their specialization.

Advanced Standing students in the Curriculum and Educator Development (CED); Learning, Design, and Technology (LDT); Literacy Research, Policy & Practice; and Mathematics Education concentrations are expected to complete concentration required courses first, and then select from concentration electives listed in the Ph.D. in Curriculum and Instruction information for the remaining concentration credit hours if applicable. All decisions regarding concentration courses require Concentration Coordinator and Program Advisor approval.

The Advanced Standing Literacy Education concentration and Urban Education concentration require students, with approval of the Program Advisor, to select courses from the concentration electives to meet specialization requirements in the Ph.D. in Curriculum and Instruction.

Advanced Standing students should schedule an advising meeting in the first semester to map out a program of study using Advanced Standing concentration planning sheets. The Ph.D. website at mdsk.charlotte.edu/academic-programs/phd-curriculum-and-instruction/prospective-students contains additional information, including updated planning sheets for each Advanced Standing concentration.

A minimum of 48 credit hours are required to complete the Ph.D. in Curriculum and Instruction degree under the Advanced Standing option. Once the minimums are satisfied, the remaining hours, if any, can be satisfied via elective coursework within the concentration area of study pending Concentration Coordinator and Program Advisor approval. Courses outside the program of study and concentration require submission of an academic petition and Graduate Program Director approval.

Curriculum and Educator Development (CED)

Concentration Courses for Advanced Standing (15 credit hours)

For Advanced Standing in the Curriculum and Educator Development (CED) Concentration, students complete 15 credit hours in required specialization coursework.

Required Courses (15 credit hours)

- EDCI 8156 - Critical Issues in K-12 Curriculum and Instruction (3)
- EDCI 8157 - Analysis of Inquiry in Curriculum, Instruction, and Educator Development (3)
- EDCI 8158 - Research in Curriculum, Instruction, and Educator Development (3)
- EDCI 8650 - Scholarly Readings and Research in Curriculum, Instruction, and Educator Development (3)
- EDCI 8681 - Seminar in College Teaching (3)

Elective Courses

Advanced Standing students may choose to take additional specialization coursework beyond the required 15 credit hours. Recommended specialization electives for Advanced Standing follow and should be selected in consultation with the Program Advisor.

- EDCI 8080 - Topics in Curriculum, Instruction, and Educator Development (3)
- EDCI 8475 - College Co-Teaching Internship in Curriculum and Instruction (3)
- EDCI 8485 - College Teaching and Educator Development Internship (3)
- EDCI 8655 - Seminar on Practice-Based Teacher Education and the Science of Learning (3)
- EDCI 8850 - Independent Study in Curriculum and Educator Development (3)

Learning, Design, and Technology (LDT) Concentration Courses for Advanced Standing (15 credit hours)

For Advanced Standing in the Learning, Design, and Technology (LDT) Concentration, students are required to complete a total of 15 credit hours in specialization coursework. This includes 6 credit hours of required courses and 9 credit hours of specialization electives.

Required Courses (6 credit hours)

- ADMN 8695 - Advanced Seminar in Teaching and Learning (3)
- ELDT 8102 - Research in Learning, Design, and Technology (3)

Elective Courses (9 credit hours)

Select 3 from the following, in consultation with the Program Advisor. Students may enroll in graduate-level credit outside of this list with approval of the Program Advisor and Program Director.

- EDCI 8681 - Seminar in College Teaching (3)
- ELDT 8000 - Topics in Learning, Design, and Technology (1 to 6)

ELDT 8100 - Foundations of Learning, Design, and Technology (3)
 ELDT 8110 - Instructional Design (3)
 ELDT 8120 - Current Trends in Learning, Design, and Technology (3)
 ELDT 8121 - Advanced Instructional Design (3)
 ELDT 8130 - Instructional Multimedia Development (3)
 ELDT 8135 - Learning Media, Resources and Technology (3)
 ELDT 8140 - Instructional Video Development (3)
 ELDT 8150 - Design, Development, and Evaluation of Online Learning Systems (3)
 ELDT 8160 - Designing Learning Systems with Simulation and Game Technology (3)
 ELDT 8170 - Human Performance Technology (3)
 ELDT 8800 - Individual Study in Learning, Design, and Technology (1 to 6)

Literacy Education Concentration Courses for Advanced Standing (15 credit hours)

For Advanced Standing in the Literacy Education Concentration, students are required to complete a total of 15 credit hours in their specialization. Courses are selected from the following list of specialization electives. Consultation with Program Advisor is required. Advanced Standing students may enroll in graduate-level credit not listed with approval of the Program Advisor.

ADMN 8101 - Perspectives on Adult Learning Theory (3)
 EDCI 8040 - Topics in Literacy Education (3)
 EDCI 8070 - Topics in Urban Educational Leadership (3)
 EDCI 8120 - Perspectives in Literacy Research, Policy, and Practice (3)
 EDCI 8129 - Linguistics and Language Learning (3)
 EDCI 8133 - Multiculturalism and Children's Literature (3)
 EDCI 8134 - Early Black American Literature (3)
 EDCI 8139 - Perspectives in African American Literature (3)
 EDCI 8140 - Current Issues and Practices in Literacy Education (3)
 EDCI 8183 - Teaching Multilingual Learners (3)
 EDCI 8201 - Perspectives in Immigration and Urban Education (3)
 EDCI 8202 - Ethnographies of Urban Schools, Communities, and Literacies (3)
 EDCI 8206 - Globalization, Communities, and Schools (3)
 EDCI 8252 - K-12 Writing Development and Instruction (3)
 EDCI 8254 - Collaborative Leadership in Literacy Education (3)
 EDCI 8255 - Disciplinary Literacy (3)
 EDCI 8256 - Literacy Assessment and Intervention (3)
 EDCI 8260 - Psychological and Historical Influences on Society (3)
 EDCI 8261 - Human Identity Development (3)
 EDCI 8262 - Social Dynamics and Systems that Educate (3)
 EDCI 8263 - Social Action and Advocacy (3)
 EDCI 8265 - Multiliteracies in a Global World: Reading and Writing Texts in New Times (3)

EDCI 8462 - Supervision of Student Teachers (3)
 EDCI 8475 - College Co-Teaching Internship in Curriculum and Instruction (3)
 EDCI 8640 - Readings in Literacy Research (3)
 EDCI 8681 - Seminar in College Teaching (3)
 EDCI 8682 - Seminar in Professional and Grant Writing (3)
 ENGL 6008 - Topics in Advanced Technical Communication (3)
 ENGL 6062 - Topics in Rhetoric (3)
 ENGL 6070 - Topics in English (3)
 ENGL 6103 - Introduction to Children's Literature and Culture (3)
 ENGL 6112 - Shakespeare's Tragedies (3)
 ENGL 6116 - Technical/Professional Writing (3)
 ENGL 6125 - The Romantic Era, 1785-1832 (3)
 ENGL 6127 - Seminar in Language, Culture, and Society (3)
 ENGL 6141 - American Romanticism (3)
 ENGL 6142 - American Realism and Naturalism (3)
 TESL 6000 - Topics in Teaching English as a Second Language (1 to 6)

Literacy Research, Policy & Practice Concentration Courses for Advanced Standing (15 credit hours)

For Advanced Standing in the Literacy Research, Policy, & Practice Concentration, students complete 15 credit hours in required specialization coursework.

Required Courses (15 credit hours)

EDCI 8040 - Topics in Literacy Education (3)
 EDCI 8041 - Topics in Literacy Research (3)
 EDCI 8120 - Perspectives in Literacy Research, Policy, and Practice (3)
 EDCI 8250 - Literacy and Language Development (3)
 EDCI 8255 - Disciplinary Literacy (3)

Elective Courses

Advanced Standing students may choose to take additional specialization coursework beyond the required 15 credit hours. Recommended specialization electives for Advanced Standing follow and should be selected in consultation with the Program Advisor.

EDCI 8252 - K-12 Writing Development and Instruction (3)
 EDCI 8256 - Literacy Assessment and Intervention (3)

Mathematics Education Concentration Courses for Advanced Standing (18 credit hours)

For Advanced Standing in the Mathematics Education Concentration, students are required to complete a total of 18 credit hours in specialization coursework. This includes 15 credit hours of required courses and 3 credit hours of specialization electives.

Required Courses (15 credit hours)

EDCI 8112 - Theoretical Foundations of Learning Mathematics (3)
 EDCI 8113 - Research in Mathematics Education (3)
 EDCI 8114 - Advanced Topics in Mathematics Education (3)

EDCI 8115 - Issues in the Teaching of Mathematics (3)
EDCI 8160 - Readings in Mathematics Education (3)

Elective Courses (3 credit hours)

Students may select from the following, in consultation with the Program Advisor.

EDCI 8004 - Topics in Analysis (3)
EDCI 8008 - Topics in Geometry and Topology (3)
EDCI 8010 - Topics in Mathematics Education (3)
EDCI 8101 - Foundations of Mathematics (3)
EDCI 8102 - Real Analysis for Mathematics Teachers (3)
EDCI 8103 - Computer Techniques and Numerical Methods (3)
EDCI 8106 - Modern Algebra for Mathematics Teachers (3)
EDCI 8107 - Linear Algebra for Mathematics Teachers (3)
EDCI 8118 - Non-Euclidean Geometry (3)
EDCI 8660 - Readings in Urban Educational Research (3)
EDCI 8860 - Independent Study in Mathematics Education (3)

Urban Education Concentration Courses for Advanced Standing (9 credit hours)

For Advanced Standing in the Urban Education Concentration, students are required to complete a total of 9 credit hours in their specialization. Courses are selected from the following list of specialization electives. Advanced Standing students may enroll in graduate-level credit not listed with approval of the Program Advisor.

Elective Courses (9 credit hours)

Select 3 courses from the following electives. Program Advisor consultation is required to enroll.

EDCI 8061 - Topics in Urban Educational Research (3)
EDCI 8070 - Topics in Urban Educational Leadership (3)
EDCI 8075 - Topics in Urban-Regional Education (3)
EDCI 8133 - Multiculturalism and Children's Literature (3)
EDCI 8134 - Early Black American Literature (3)
EDCI 8139 - Perspectives in African American Literature (3)
EDCI 8300 - Social Stratification and Urban Schools and Communities (3)
EDCI 8310 - Transformative Black Education (3)
EDCI 8311 - Critical Readings in Urban Education Research (3)
EDCI 8312 - Urban Schooling, Curriculum, and Pedagogy (3)
EDCI 8320 - Social Deviance, Delinquency, and Education (3)
EDCI 8330 - History of Urbanization and Its Impact on Schooling (3)
EDCI 8460 - Internship in Urban Education (3)
EDCI 8660 - Readings in Urban Educational Research (3)
EDCI 8682 - Seminar in Professional and Grant Writing (3)
EDCI 8880 - Independent Study in Urban Education (1 to 3)

Advanced Standing Degree Total = 48 Credit Hours

Advising

An Advisor is assigned to each student within the first year of study. The Advisor, Concentration Coordinator, and Program Director provide initial advising until the end of the first year (12 credit hours) when the Advisor assumes responsibility. By the beginning of the second year, the student is required to submit a Program of Study which is approved by the Advisor, Concentration Coordinator, and Program Director. The Advisor, Concentration Coordinator, and Program Director also support the student in identifying faculty whose research interests and expertise are congruent with the student's probable area of dissertation inquiry. The assistance of the Advisor does not relieve the student of responsibility for completing required work and for following departmental or University procedures. In the semester in which the student takes the Qualifying Comprehensive Examination, the student reaches agreement with a faculty member to serve as dissertation chair. The chair must be a member of the Curriculum and Instruction faculty. Students should complete the Qualifying Comprehensive Examination by the end of the third year in the program. Students who enter the Ph.D. program under Advanced Standing must take the Qualifying Comprehensive Examination before the end of their fourth semester in the doctoral program.

Admission to Candidacy

Students are considered candidates for the doctoral degree upon: (a) successful completion of the Qualifying Comprehensive Examination and (b) approval of the Dissertation Proposal. Candidacy must be achieved the semester before the degree is conferred.

Application for Degree

Students must submit an Application for Degree in the semester in which they successfully defend their dissertation proposal. Adherence to Graduate School deadlines and requirements is expected. Degree requirements are completed with the successful defense of the dissertation and when the final copy of the dissertation has been filed in the Graduate School.

M.Ed. in Curriculum and Instruction

The Master of Education in Curriculum and Instruction is designed for experienced licensed teachers in elementary education, middle grades, secondary education, and Teaching English as a Second Language in schools who desire advanced study in content and pedagogy, and seek an opportunity to integrate advanced study with their teaching experiences. In addition, the program includes a Curriculum Leadership concentration for non-licensed educators who seek to expand their knowledge of curriculum and instruction. Candidates acquire the skills,

knowledge, dispositions, and abilities required to assume a leadership role.

Program Goals

Successful graduates possess a comprehensive pedagogical, conceptual, and reflective knowledge base that can be applied to their classrooms through effective instruction, responsiveness, and collaboration. This developed and applied knowledge is, in turn, shared with other professionals through a variety of leadership opportunities. Both the College's Conceptual Framework and the following goals provide structure for the entire program.

Program graduates are able to:

- 1) Self-direct their personal and professional growth
- 2) Respond effectively to learner differences, equity and diversity, and global learning communities
- 3) Demonstrate advanced pedagogical content knowledge of the curriculum, as well as apply 21st Century knowledge, skills, and technical expertise
- 4) Improve educational practice through critical self-reflection, self-assessment, and applied research
- 5) Work collaboratively with colleagues, professionals, parents, guardians, families and individuals charged with the well-being of learners
- 6) Assume a leadership role at the local, district, regional, state, or national level

National Board for Professional Teaching Standards Connections

A unique feature of this program is its strategic alignment with core propositions, skill sets, academic language, and concepts from the National Board for Professional Teaching Standards (NBPTS). Activities are designed to provide information and support to potential and current candidates. They also account for recent certification program changes by the NBPTS.

Admission Requirements

- A bachelor's degree from a college or university accredited by an accepted accrediting body
- For candidates who will apply for the North Carolina "M" license, a North Carolina "A" license (Standard Professional 1 [SP1] Professional Educator's License) in Middle Grades (6-9), Secondary Education (9-12), or English as a Second Language (ESL), or the equivalent from another state in both the concentration and content field of the program to which the candidate is making application
- Teaching experience in a middle grades or secondary classroom (Middle Grades or Secondary Education concentrations only)
- Candidates enrolled in the Curriculum Leadership concentration cannot apply for "M" license since the track is not designed to support advanced licensure
- An undergraduate GPA of 3.0 overall (on a 4.0 scale); if an applicant has earned or attempted a post-

baccalaureate degree (i.e., master's, doctoral, or other), grades in that program will also be taken into consideration

- A written narrative providing a statement of purpose for master's degree study
- Satisfactory recommendations from three professional educators

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Degree Requirements

The M.Ed. in Curriculum and Instruction degree requires a total of 30 credit hours of coursework. Candidates must select and fulfill the requirements of one of four concentrations: (1) Middle Grades Education, (2) Secondary Education, (3) Teaching English as a Second Language (TESL), or (4) Curriculum Leadership. For the first three selected concentrations, the candidate's initial A license -- as issued by the state of North Carolina -- must match their concentration to receive an "M" license. Candidates enrolled in the Curriculum Leadership concentration will not be pursuing advanced licensure.

Curriculum Leadership Concentration

This non-licensure concentration provides an avenue for education professionals who do not wish to seek or require advanced teaching licensure to pursue a Master's Degree. These teachers include those working in alternative school setting, including but not limited to independent schools. The Curriculum Leadership concentration includes classes in education leadership and learning, design, and technology as well as courses currently offered in existing concentrations of the program.

Note: This concentration does not lead to advanced licensure.

Core Courses (12 credit hours)

MDSK 6156 - Curriculum, Teaching, and Contemporary Issues in Education (3)
 MDSK 6260 - Teacher Leadership (3)
 MDSK 6691 - Seminar in Professional Development (3)
 RSCH 6101 - Research Methods (3)

Equity in Education Elective Course (3 credit hours)

Select one of the following electives which focus on diversity, equity, and inclusion (subject to availability) from the list of courses below. Two additional courses may be selected as electives. Candidates are required to choose courses under consultation of their advisor.

EDUC 6000 - Topics in Education (1 to 6)
 READ 6265 - Multiliteracies in a Global World: Reading and Writing Texts in New Times (3)
 TESL 6204 - Multicultural Education (3)

TESL 6206 - Globalization, Communities, and Schools (3)

Content Elective Courses (15 credit hours)

Select up to 15 credit hours from the list of courses below (subject to availability). Candidates are required to choose courses under consultation of their advisor. A maximum of 6 credit hours from the equity electives may be applied.

ADMN 6100 - Fundamentals of Educational Leadership (3)

ADMN 6105 - Legal Aspects of Schooling (3)

EDUC 6000 - Topics in Education (1 to 6)

ELDT 5100 - Technology Integration in Education (3)

ELDT 6110 - Instructional Design (3)

ELDT 6135 - Learning Media, Resources, and Technology (3)

ENGL 6274 - Contexts and Issues in the Teaching of English (3)

MAED 6252 - Advanced Methods in Middle and Secondary Mathematics Education (3)

MDLG 6225 - Issues in Middle Grades Education (3)

MDLG 6800 - Individual Study in Middle Grades Education (1 to 6)

MDSK 6220 - Adolescence and Learning (2 or 3)

MDSK 6250 - Issues in 6-12 Science Education (3)

MDSK 6254 - Issues in 6-12 Social Studies Education (3)

MDSK 6351 - Advanced Methods in Middle and Secondary Science (3)

MDSK 6354 - Advanced Methods in Middle and Secondary Social Studies (3)

READ 6265 - Multiliteracies in a Global World: Reading and Writing Texts in New Times (3)

SECD 6800 - Individual Study in Secondary Education (1 to 6)

TESL 6204 - Multicultural Education (3)

TESL 6206 - Globalization, Communities, and Schools (3)

Elementary Education Concentration

The concentration in Elementary Education (ELED) is designed to prepare teachers to work with K-6 learners in the public schools. This strand is designed for licensed educators who seek to expand their knowledge of curriculum and instruction while acquiring the skills, knowledge, dispositions, and abilities required to assume a leadership role.

Core Courses (12 credit hours)

ELED 6200 - Current Issues in Global and Urban Schools (3)

or MDSK 6156 - Curriculum, Teaching, and Contemporary Issues in Education (3)

or TESL 6206 - Globalization, Communities, and Schools (3)

or EDUC 5153 - Application of Coaching Principles (3)*

** Students with an instructional coaching emphasis, should take EDUC 5153 instead of other options.*

MDSK 6260 - Teacher Leadership (3)

MDSK 6691 - Seminar in Professional Development (3)

RSCH 6101 - Research Methods (3)

Advanced Content Specialization (12 credit hours)

Select 12 credit hours from the following:

EDUC 5152 - Principles of Coaching II (3)*

** For those with an instructional coaching emphasis, take EDUC 6152 as one elective.*

ELED 6202 - Creating Effective Elementary Classroom Environments for All Students (3)

ELED 6203 - Instructional Differentiation and Leadership for 21st Century Learners (3)

ELED 6303 - Teacher Inquiry and Data Analysis in the Classroom (3)

READ 6250 - Emergent and Elementary Literacy (3)

Electives/Focus Areas (6 credit hours)

Select six credit hours from the following with advisor consultation.

EDUC 5150 - Principles of Coaching I (3)

EDUC 5151 - Coaching for an Equitable Learning Environment (3)

EDUC 5152 - Principles of Coaching II (3)

EDUC 5153 - Application of Coaching Principles (3)

ELDT 5100 - Technology Integration in Education (3)

ELDT 6135 - Learning Media, Resources, and Technology (3)

ENGL 6161 - Introduction to Linguistics (3)

MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)

EDUC 6000-6999

ELED 6000-6999

READ 6000-6999

Middle Grades Education Concentration

Core Courses (18 credit hours)

MDSK 6156 - Curriculum, Teaching, and Contemporary Issues in Education (3)

MDSK 6220 - Adolescence and Learning (2 or 3)

MDSK 6260 - Teacher Leadership (3)

MDSK 6691 - Seminar in Professional Development (3)

RSCH 6101 - Research Methods (3)

TESL 6206 - Globalization, Communities, and Schools (3)

Middle Grades Course (3 credit hours)

MDLG 6225 - Issues in Middle Grades Education (3)

Advanced Content Specialization and Advanced Methods Courses (6 credit hours)

Advanced Methods Course (3 credit hours)

Students select one of the following from their content concentration:

ENGL 6274 - Contexts and Issues in the Teaching of English (3)

MAED 6252 - Advanced Methods in Middle and Secondary Mathematics Education (3)

MDSK 6351 - Advanced Methods in Middle and

Secondary Science (3)
 MDSK 6354 - Advanced Methods in Middle and
 Secondary Social Studies (3)

Advanced Content Specialization Courses (3 credit hours)
Students select one of the following in their content area:

English

ENGL 5000-6999 - English Elective (3)
 READ 5000-6999 - Reading Education Elective (3)
 MDSK 5000-6999 - Middle and Secondary Education
 Elective (3) (*topics course that is content specific*)
 READ 6265 - Multiliteracies in a Global World: Reading
 and Writing Texts in New Times (3)
 or EDCI 8265 - Multiliteracies in a Global World:
 Reading and Writing Texts in New Times (3)

Mathematics

MAED 5000-6999 - Mathematics Education Elective (3)
 MATH 5000-6999 - Mathematics Elective (3)
 STAT 5000-6999 - Statistics Elective (3)
 MDSK 5000-6999 - Middle and Secondary Education
 Elective (3) (*topics course that is content specific*)
 BIOL 5000-6999 - Biology Elective (3)
 CHEM 5000-6999 - Chemistry Elective (3)
 ESCI 5000-6999 - Earth Science Elective (3)
 GEOG 5000-6999 - Geography Elective (3)
 PHYS 5000-6999 - Physics Elective (3)
 MDSK 5000-6999 - Middle and Secondary Education
 Elective (3) (*topics course that is content specific*)
 MDSK 6250 - Issues in 6-12 Science Education (3)

Social Studies

AFRS 5000-6999 - Africana Studies Elective (3)
 GEOG 5000-6999 - Geography Elective (3)
 HIST 5000-6999 - History Elective (3)
 MDSK 5000-6999 - Middle and Secondary Education
 Elective (3) (*topics course that is content specific*)
 POLS 5000-6999 - Political Science Elective (3)
 RELS 5000-6999 - Religious Studies Elective (3)
 WGST 5000-6999 - Women's and Gender Studies
 Elective (3)
 MDSK 6254 - Issues in 6-12 Social Studies Education (3)

Advanced Specialization Pedagogy Course (3 credit hours)

A graduate-level pedagogy course should be chosen in consultation with student's advisor. Possible elective options include, and are limited to one of, the following:

EDUC 6000 - Topics in Education (1 to 6) *
 EDUC 6144 - Introduction to National Board Certification
 (3)
 EDUC 7126 - Comparative Education (3)
 ELDT 5100 - Technology Integration in Education (3)
 ELDT 6110 - Instructional Design (3)
 ELDT 6135 - Learning Media, Resources, and Technology
 (3)

MDLG 6800 - Individual Study in Middle Grades Education
 (1 to 6)
 RSCH 6109 - Assessment and Evaluation Methods (3)
 RSCH 6110 - Descriptive and Inferential Statistics (3)
 TESL 5103 - Methods in Teaching English as a Second
 Language (3)
 READ 6265 - Multiliteracies in a Global World: Reading
 and Writing Texts in New Times (3)

** Students may repeat EDUC 6000 up to 6 credit hours
 and substitute these credit hours for courses within the
 Advanced Content Specialization or Advanced
 Specialized Pedagogy Areas.*

Secondary Education Concentration

Core Courses (18 credit hours)

MDSK 6156 - Curriculum, Teaching, and Contemporary
 Issues in Education (3)
 MDSK 6220 - Adolescence and Learning (2 or 3)
 MDSK 6260 - Teacher Leadership (3)
 MDSK 6691 - Seminar in Professional Development (3)
 RSCH 6101 - Research Methods (3)
 TESL 6206 - Globalization, Communities, and Schools (3)

**Advanced Content Specialization and Advanced Methods
 Courses (9 credit hours)**

Advanced Methods Course (3 credit hours)

Students select one from their content concentration:
 ENGL 6274 - Contexts and Issues in the Teaching of
 English (3)

MAED 6252 - Advanced Methods in Middle and
 Secondary Mathematics Education (3)
 MDSK 6351 - Advanced Methods in Middle and
 Secondary Science (3)
 MDSK 6354 - Advanced Methods in Middle and
 Secondary Social Studies (3)

Advanced Content Specialization Courses (6 credit hours)

Students select two of the following in their content area:
English

ENGL 5000-6999 - English Elective (3)
 READ 5000-6999 - Reading Education Elective (3)
 MDSK 5000-6999 (3) - Middle and Secondary Education
 Elective (*topics course that is content specific*)
 READ 6265 - Multiliteracies in a Global World: Reading
 and Writing Texts in New Times (3)
 or EDCI 8265 - Multiliteracies in a Global World:
 Reading and Writing Texts in New Times (3)

Mathematics

MAED 5000-6999 - Mathematics Education Elective (3)
 MATH 5000-6999 - Mathematics Elective (3)
 STAT 5000-6999 - Statistics Elective (3)
 MDSK 5000-6999 - Middle and Secondary Education
 Elective (3) (*topics course that is content specific*)

Science

BIOL 5000-6999 - Biology Elective (3)
 CHEM 5000-6999 - Chemistry Elective (3)
 ESCI 5000-6999 - Earth Science Elective (3)
 GEOG 5000-6999 - Geography Elective (3)
 PHYS 5000-6999 - Physics Elective (3)
 MDSK 5000-6999 - Middle and Secondary Education
 Elective (3) (*topics course that is content specific*)
 MDSK 6250 - Issues in 6-12 Science Education (3)

Social Studies

AFRS 5000-6999 - Africana Studies Elective (3)
 GEOG 5000-6999 - Geography Elective (3)
 HIST 5000-6999 - History Elective (3)
 MDSK 5000-6999 - Middle and Secondary Education
 Elective (3) (*topics course that is content specific*)
 POLS 5000-6999 - Political Science Elective (3)
 RELS 5000-6999 - Religious Studies Elective (3)
 WGST 5000-6999 - Women's and Gender Studies
 Elective (3)
 MDSK 6254 - Issues in 6-12 Social Studies Education (3)

Note: For students interested in teaching at the community college level, Master's degrees with concentrations in Mathematics Education and English Education are offered through the Departments of Mathematics & Statistics and English, respectively. Please see the individual M.S. in Mathematics and M.A. in English sections of the Graduate Catalog for details.

Advanced Specialized Pedagogy Course (3 credit hours)

Select a pedagogy course with advisor consultation. Possible elective options include, and are limited to, one of the following:

EDUC 6000 - Topics in Education (1 to 6) *
 EDUC 6144 - Introduction to National Board Certification (3)
 EDUC 7126 - Comparative Education (3)
 ELDT 5100 - Technology Integration in Education (3)
 ELDT 6110 - Instructional Design (3)
 ELDT 6135 - Learning Media, Resources, and Technology (3)
 READ 6265 - Multiliteracies in a Global World: Reading and Writing Texts in New Times (3)
 RSCH 6109 - Assessment and Evaluation Methods (3)
 RSCH 6110 - Descriptive and Inferential Statistics (3)
 SECD 6800 - Individual Study in Secondary Education (1 to 6)
 TESL 5103 - Methods in Teaching English as a Second Language (3)

** Students may repeat EDUC 6000 up to 6 credit hours and substitute these credit hours for courses within the Advanced Content Specialization or Advanced Specialized Pedagogy Areas.*

Teaching English as a Second Language Concentration

The Concentration in Teaching English as a Second Language (TESL) is designed to prepare teachers to work with K-12 learners in the public schools. Additionally, it prepares candidates to teach in adult ESL (English as a Second Language) or in international contexts. The program provides a pathway to ESL licensure for current teachers who already possess an "A" level license in another teaching discipline. This program serves the current needs of the educational community by preparing highly qualified teachers to work with diverse English Learners (ELs) in a variety of educational settings.

Core Courses (12 credit hours)

TESL 5103 - Methods in Teaching English as a Second Language (3)
 TESL 5104 - Authentic Assessment (3)
 TESL 5205 - Second Language Acquisition and Linguistics in K-12 Schools (3)
 TESL 6204 - Multicultural Education (3)

Advanced Methods Course (3 credit hours)

TESL 6276 - Advanced Pedagogy in Teaching English as a Second Language (3)

Advanced Specialization Courses (15 credit hours)

Required Courses (12 credit hours)

MDSK 6260 - Teacher Leadership (3)
 RSCH 6101 - Research Methods (3)
 TESL 6206 - Globalization, Communities, and Schools (3)
 TESL 6691 - Seminar in Professional Development (3)
 or MDSK 6691 - Seminar in Professional Development (3)

Elective Course (3 credit hours)

Select one of the following from the approved list. Other course substitutions may be allowed with prior approval from the program director. Students may also take an approved study abroad course as an elective option.

EDUC 6000 - Topics in Education (1 to 6) *
 ENGL 6161 - Introduction to Linguistics (3)
 ELDT 6135 - Learning Media, Resources, and Technology (3)
 READ 6204 - Teaching Reading to English Language Learners (3)
 READ 6265 - Multiliteracies in a Global World: Reading and Writing Texts in New Times (3)

** Students may repeat EDUC 6000 up to 6 credit hours and substitute these credit hours for courses within the Advanced Content Specialization or Advanced Specialized Pedagogy Areas.*

Capstone Experience

Students in all concentrations must complete a capstone experience. They complete either a comprehensive portfolio or research project, as assigned by their program advisor.

Degree Total = 30 Credit Hours

Advising

Each candidate will have an assigned advisor within the Department of Middle Grades, Secondary, and K-12 Education.

Licensure

Graduates of the M.Ed. who have an "A" license will be eligible to receive an Advanced Competency "M" license (Standard Professional 2 [SP2] Professional Educator's License) in Middle Grades (6-9), Secondary (9-12), or English as a Second Language (ESL) from the state of North Carolina in addition to their Master's Degree if they are enrolled in the aligned concentration. Candidates enrolled in the Curriculum Leadership concentration are not eligible for advanced licensure.

Note: Standard Professional 2 (SP2) Professional Educator's Licenses are intended for teachers with 3 or more years of teaching experience, and are valid for five years. Teachers who are fully licensed and "Highly Qualified" in another state who have three or more years of teaching experience in another state AND who meet NC's Praxis testing requirements OR have National Board Certification are issued the SP2 Professional Educator's license.

Committees

Candidates convene a committee of three graduate faculty members whom they select with assistance from their department advisor if a research project is required as the capstone experience. The primary role of this committee is to assess the research project. All other candidates complete the comprehensive portfolio which is guided by the course instructor for MDSK 6691 or TESL 6691.

Research Opportunities and Experiences

There are many opportunities for candidates to participate in research studies on either an independent or collaborative basis. These opportunities are available with Department faculty members, through assigned coursework, and through the research project.

M.A.T. in Middle and Secondary Education

The Master of Arts in Teaching (M.A.T.) in Middle Grades or Secondary Education program is designed for individuals with a bachelor's degree and a Major in English, Mathematics, History, Biology, Chemistry, Earth Sciences, Physics, or a related field, or a bachelor's degree and a major relevant to one of the Career and Technical Education (CTE) concentrations (i.e., Business/IT, Marketing, Technology, and Family and Consumer Sciences).

The M.A.T. program is a 30 credit hour program composed of two phases: the Graduate Certificate phase (Phase I) and the Master's degree completion phase (Phase II). Completion of Phase I of the M.A.T. leads to the initial Standard Professional I teaching license in the related content area. Phase I requires 16 credit hours of coursework, including the graduate student teaching/internship experience. Upon completion of Phase I, qualified candidates may continue into Phase II upon acceptance into the program to complete the remaining requirements for the Master's degree and qualify for the advanced Standard Professional II teaching license.

All courses for both phases of the M.A.T. must be completed within 7 years. Coursework within Phase I/Graduate Certificate must be completed within 5 years.

General Requirements for Admission to the Graduate School

Please refer to admission information in the Graduate School section of this *Catalog*.

Admission Requirements for all M.A.T. (Phase II) programs

- 1) Completion of the Graduate Certificate in Teaching
- 2) A minimum graduate GPA of 3.5 in the Graduate Certificate in Teaching
- 3) One recommendation from a full-time faculty member who has taught you in the Graduate Certificate in Teaching program
- 4) A statement of purpose
- 5) Official transcripts
- 6) Apply online at gradadmissions.charlotte.edu

The admission process includes timely completion of the Application for Graduation from the Graduate Certificate program.

Students with a GPA below 3.5 in the Graduate Certificate Phase I may be considered for admission to the M.A.T.

program with scores above the 30th percentile on either the GRE or Miller Analogies Test.

Degree Requirements

Phase I/Graduate Certificate (16 credit hours)

The Graduate Certificate (Phase I of the M.A.T.) is a 16 credit hour program.

Instructional Design Courses (4 credit hours)

MDSK 5204 - The Connected Classroom (2)

MDSK 6162 - Planning for K-12 Instruction (3)

Content Methods Course (3 credit hours)

Select the content methods course corresponding with the intended area of licensure:

ENGL 5254 - Teaching English/Communications Skills to Middle and Secondary School Learners (3)

MAED 5252 - Teaching Mathematics to Secondary School Learners (3)

MDSK 5251 - Teaching Science to Middle and Secondary School Learners (3)

MDSK 5253 - Teaching Social Studies to Middle and Secondary School Learners (3)

MDSK 5255 - Methods in Teaching Career and Technical Education (3)

Lab Course (1 credit hour)

Assessment Course (3 credit hours)

Select the assessment course section that corresponds with the intended area of licensure:

MDSK 5300 - Content Area Instruction and Assessment (3)

Adolescent Development Course (2 credit hours)

Select the adolescent development course that corresponds with the intended area of licensure:

MDLG 5130 - The Middle Grades Experience (2)

SECD 5140 - The Secondary School Experience (2)

Student Teaching (3 credit hours)

Complete the following required full-time student teaching internship:

MDSK 6470 - Graduate Student Teaching and Internship (3 to 6)

Note: The graduate-level student teaching/internship is the culminating experience in Phase I of the M.A.T., offering candidates the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license.

Candidates are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and University faculty. -

Residency teachers must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship

experience and licensure requirements. This contact should take place upon admission to the program.

There is no required internship for Phase II of the M.A.T.

Phase II/Completion of M.A.T. (14 credit hours)

Core Courses (8 credit hours)

MDSK 6220 - Adolescence and Learning (2 or 3)

MDSK 6260 - Teacher Leadership (3)

MDSK 6691 - Seminar in Professional Development (3)

Advanced Content Specialization Courses (3 credit hours)

Select one of the following areas:

Middle Grades Education

MDLG 6225 - Issues in Middle Grades Education (3)

Secondary Education

Students select one from the following in their content area:

Mathematics

MAED 5XXX-6XXX - Mathematics Education Elective (3)

MATH 5XXX-6XXX - Mathematics Elective (3)

STAT 5XXX-6XXX - Statistics Elective (3)

English

ENGL 5XXX-6XXX - English Elective (3)

READ 5XXX-6XXX - Reading, Language, and Literacy Elective (3)

MDSK 5XXX-6XXX - Middle, Secondary, and K-12 Education Elective (3) (topics course that is content specific)

Science

BIOL 5XXX-6XXX - Biology Elective (3)

CHEM 5XXX-6XXX - Chemistry Elective (3)

ESCI 5XXX-6XXX - Earth Sciences Elective (3)

GEOG 5XXX-6XXX - Geography Elective (3)

PHYS 5XXX-6XXX - Physics Elective (3)

Social Studies

AFRS 5XXX-6XXX - Africana Studies Elective (3)

GEOG 5XXX-6XXX - Geography Elective (3)

HIST 5XXX-6XXX - History Elective (3)

MDSK 5XXX-6XXX - Middle, Secondary, and K-12 Education Elective (3) (topics course that is content specific)

POLS 5XXX-6XXX - Political Science Elective (3)

RELS 5XXX-6XXX - Religious Studies Elective (3)

WGST 5XXX-6XXX - Women's and Gender Studies Elective (3)

Career and Technical Education Concentration Course

Candidates in one of the Career and Technical Education (CTE) concentrations must select one of the following course options:

MDLG 6225 - Issues in Middle Grades Education (3)
 RSCH 6101 - Research Methods (3)
 TESL 6206 - Globalization, Communities, and Schools (3)

Advanced Methods Course (3-4 credit hours)

Select the one related advanced methods area:

ENGL 6274 - Context and Issues in the Teaching of English
 (4)

MAED 6252 - Advanced Methods in Middle and
 Secondary Mathematics (3)

MDSK 6351 - Advanced Methods in Middle and
 Secondary Science (3)

MDSK 6354 - Advanced Methods in Middle and
 Secondary Social Studies (3)

MDSK 6355 - Advanced Methods of Teaching Career and
 Technical Education (3)

Capstone Requirement

The capstone experience for the M.A.T. is fulfilled by
 completing a Comprehensive Portfolio.

Degree Total = 30 Credit Hours

Clinical Field Experiences

Most courses require candidates to develop their knowledge, skills, and dispositions in public school/agency settings. All candidates are expected to complete clinical experiences in at least two significantly different settings. Clinical field experiences provide opportunities for helping all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, candidates apply theories and understandings gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. These structured experiences can take place in multiple settings such as neighboring schools or districts, day care centers and after-school programs, alternate youth centers, or in the schools and classrooms in which the candidates work.

Clinical experiences for Residency teachers may be approved in significantly different classrooms within their school of employment. Alternative settings must be approved by the instructor.

Advising

All candidates are assigned an advisor upon formal admission to the program. Candidates should consult with their advisors at least once each semester.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, candidates will be recommended for the North Carolina initial Standard Professional I teaching license. For this initial license, candidates are required to complete an

electronic licensure portfolio that is created during coursework and student teaching. Upon successful completion of Phase II, candidates will be recommended for the North Carolina advanced Standard Professional II teaching license. For the advanced license, candidates are required to complete an advanced electronic licensure portfolio during coursework.

Graduate Certificate in Teaching: Middle and Secondary Education

The Graduate Certificate in Teaching - Middle Grades and Secondary Education is a 16-18 credit hour program, including the graduate student teaching/internship experience plus any background content courses needed, designed for students who hold a bachelor's degree. Upon successful completion of the Graduate Certificate, students are eligible for the North Carolina Standard Professional 1 (SP1) Professional Educator's License. The program is designed for current (Residency Teachers) and aspiring middle and secondary school teachers of math, science, English language arts, social studies, and Career and Technical Education fields (Business, Marketing, Technology, and Family and Consumer Sciences).

The required courses for the Graduate Certificate are identical to Phase I of the M.A.T. Upon completion of the Graduate Certificate, qualified students have the option of continuing into Phase II to complete the M.A.T. Admission to the Graduate Certificate is separate and distinct from admission to a graduate degree program and not an indication of automatic admission to the M.A.T. degree program. For more information on this option, refer to the M.A.T. in Middle Grades and Secondary Education.

All courses for the Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to admission information in the Graduate School section of this Catalog.

Admission Requirements for the Graduate Certificate in Teaching program

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A minimum undergraduate GPA of 2.75 (*For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL)*)
- 3) One of the following:
 - a) Hold a relevant undergraduate degree

- b) Obtain or already possess 24 credit hours of coursework in the content area for which licensure is sought
- c) Passing scores on the related PRAXIS II Subject Assessment
- 4) Two professional references in a supervisory capacity (i.e. principal or manager) and/or academic references (i.e. professor)
- 5) A statement of purpose
- 6) Clear criminal background check
- 7) Apply online at graduateschool.charlotte.edu

Certificate Requirements

Concentrations

Select one of the following concentrations:

Middle Grades English Language Arts Concentration

ENGL 5254 - Teaching English/Communications Skills to Middle and Secondary School Learners (3)
 MDLG 5130 - The Middle Grades Experience (2)
 or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)
 MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5300 - Content Area Instruction and Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)

Middle Grades Mathematics Concentration

MAED 5252 - Teaching Mathematics to Secondary School Learners (3)
 MDLG 5130 - The Middle Grades Experience (2)
 or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)
 MDSK 5204 - The Connected Classroom (2)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5300 - Content Area Instruction and Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)

Middle Grades Science Concentration

MDLG 5130 - The Middle Grades Experience (2)
 or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)
 MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5251 - Teaching Science to Middle and Secondary School Learners (3)
 MDSK 5300 - Content Area Instruction and Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)

Middle Grades Social Studies Concentration

MDLG 5130 - The Middle Grades Experience (2)
 or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)
 MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5253 - Teaching Social Studies to Middle and Secondary School Learners (3)
 MDSK 5300 - Content Area Instruction and Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)

Secondary English Language Arts Concentration

ENGL 5254 - Teaching English/Communications Skills to Middle and Secondary School Learners (3)
 MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5300 - Content Area Instruction and Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)

Secondary Mathematics Concentration

MAED 5252 - Teaching Mathematics to Secondary School Learners (3)
 MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5300 - Content Area Instruction and Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)

Secondary Science Concentration

MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5251 - Teaching Science to Middle and Secondary School Learners (3)
 MDSK 5300 - Content Area Instruction and Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)

Secondary Social Studies Concentration

MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5253 - Teaching Social Studies to Middle and
 Secondary School Learners (3)
 MDSK 5300 - Content Area Instruction and
 Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for
 Adolescent Learners (1 to 3)

Career and Technical Education Business Concentration

For candidates seeking 6-12 CTE licensure in Business. CTE candidates select only one of the three offered adolescent development courses listed below: MDLG 5130 (for candidates wishing to teach at the middle school level) or SECD 5140 (for candidates wishing to teach at the secondary school level) or MDSK 6252.

MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5255 - Methods in Teaching Career and Technical
 Education (3)
 MDSK 5300 - Content Area Instruction and
 Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 MDLG 5130 - The Middle Grades Experience (2)
 or SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for
 Adolescent Learners (1 to 3)

Career and Technical Education Family and Consumer Sciences Concentration

For candidates seeking 6-12 CTE licensure in Business. CTE candidates select only one of the three offered adolescent development courses listed below: MDLG 5130 (for candidates wishing to teach at the middle school level) or SECD 5140 (for candidates wishing to teach at the secondary school level) or MDSK 6252.

MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5255 - Methods in Teaching Career and Technical
 Education (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 MDLG 5130 - The Middle Grades Experience (2)
 or SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for
 Adolescent Learners (1 to 3)

Career and Technical Education Marketing Concentration

For candidates seeking 6-12 CTE licensure in Business. CTE candidates select only one of the three offered adolescent development courses listed below: MDLG 5130 (for candidates wishing to teach at the middle school level) or SECD 5140 (for candidates wishing to teach at the secondary school level) or MDSK 6252.

MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 or TESL 6204 - Multicultural Education (3)
 MDSK 5255 - Methods in Teaching Career and Technical
 Education (3)
 MDSK 5300 - Content Area Instruction and
 Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 MDLG 5130 - The Middle Grades Experience (2)
 or SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for
 Adolescent Learners (1 to 3)

Career and Technical Education Technology Concentration

For candidates seeking 6-12 CTE licensure in Business. CTE candidates select only one of the three offered adolescent development courses listed below: MDLG 5130 (for candidates wishing to teach at the middle school level) or SECD 5140 (for candidates wishing to teach at the secondary school level) or MDSK 6252.

MDSK 5204 - The Connected Classroom (2)
 or EDUC 5100 - 21st Century Learners (3)
 or TESL 6204 - Multicultural Education (3)
 or TESL 5204 - Learning, Schools, and Community (3)
 MDSK 5255 - Methods in Teaching Career and Technical
 Education (3)
 MDSK 5300 - Content Area Instruction and
 Assessment (3)
 MDSK 6162 - Planning for K-12 Instruction (3)
 MDLG 5130 - The Middle Grades Experience (2)
 or SECD 5140 - The Secondary School Experience (2)
 or MDSK 6252 - Differentiated Instruction for
 Adolescent Learners (1 to 3)

Internship/Student Teaching

The graduate-level student teaching/internship is the culminating experience for all concentrations in the Graduate Certificate program, offering candidates the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. Candidates are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and University faculty. Residency teachers may complete the internship in their own classroom, but must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship.

experience and licensure requirements. This contact should take place upon admission to the program.

MDSK 6470 - Graduate Student Teaching and Internship (3 to 6)

or MDLG 6470 - Middle Grades Education Student Teaching Internship (3 to 5)

or SECD 6470 - Secondary Education Student Teaching Internship (3 to 5)

Certificate Total = 16-18 Credit Hours

The Curriculum Scheme applies to phase one, the Graduate Certificate phase, with the phase two being a full MAT degree. The same range of credits in phase one is noted in a separate proposal for phase two with the rationale that phase one courses apply to the MAT requirements. Therefore, the total number of credits needed to complete phase two will depend on the number of credits completed in phase one.

Advising

All candidates are assigned an advisor upon formal admission to the program. Candidates should consult with their advisors at least once each semester.

Clinical Field Experiences

Most courses require candidates to develop their knowledge, skills, and dispositions in public school/agency settings. All candidates are expected to complete clinical experiences in at least two significantly different settings. Clinical field experiences provide opportunities for helping all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, candidates apply theories and understandings gained in coursework, analyze 6-12 student learning, and develop the ability to positively impact all learners. Arrangements for the clinical field experience are made through the Office of School & Community Partnerships.

Residency teachers may complete clinical requirements in their own classroom and school. Alternative settings must be approved by the instructor. A limited number of clinical experiences may be approved in significantly different classrooms within their school of employment.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, candidates will be recommended for the North Carolina Standard Professional 1 (SP1) Professional Educator's License. For this initial license, candidates are required to complete an electronic licensure portfolio that is created during coursework and student teaching.

Graduate Certificate in Teaching: Art Education

The Graduate Certificate in Teaching for Art Education is an 16 credit hour program designed for candidates who hold a bachelor's degree and a major in Visual Arts. It is offered by the College of Education in collaboration with the College of Arts + Architecture. The Colleges collaborate to provide arts professionals an alternative pathway to a teaching certificate. Upon successful completion of the Graduate Certificate, students are eligible for the North Carolina initial Standard Professional I teaching license.

All courses for the Graduate Certificate in Teaching must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to general information provided in The Graduate School section of this Catalog.

Graduate Certificate Admission Requirements

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.75 (*For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL)*)
- 3) Three recommendations from persons knowledgeable of your interaction with children or youth
- 4) Statement of purpose
- 5) Clear criminal background check
- 6) Apply online at gradadmissions.charlotte.edu
- 7) Submission of digital portfolio

Certificate Requirements

Core Courses (13 credit hours)

ARTE 5121 - Teaching Art to Elementary Students (3)

ARTE 5122 - Teaching Art to Secondary Students (3)

MDSK 6162 - Planning for K-12 Instruction (3)

TESL 6204 - Multicultural Education (3)

MDLG 5130 - The Middle Grades Experience (2)

or SECD 5140 - The Secondary School Experience (2)

Internship/Student Teaching (3 credit hours)

The graduate-level student teaching/internship is the culminating experience of the Graduate Certificate in Teaching program, offering candidates the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. Candidates are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and university faculty. Residency teachers and teacher

assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship experience and licensure requirements. This contact should take place at least one semester before student teaching.

MDSK 6470 Graduate Student Teaching and Internship (3 to 6)

Content Background Requirements

The applicant's undergraduate coursework (and professional experiences) will be reviewed to determine if the applicant's background is sufficient to meet current standards for art teachers. If deficiencies are identified, a plan of study for additional coursework will be provided.

Certificate Total = 16 Credit Hours

Advising

All candidates are assigned an advisor upon formal admission to the program. Candidates should consult with their advisors at least once each semester.

Clinical Field Experiences

Most courses require candidates to develop their knowledge, skills, and dispositions in public school settings. These experiences broaden their ability to help all children learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, candidates apply theories and understandings gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. All candidates are expected to complete clinical experiences in at least three significantly different school settings (the graduate student teaching placement may serve as one of the settings).

Candidates who are Residency Teachers or teacher assistants must move beyond their own classrooms when completing clinical experiences. A limited number of clinical experiences may be approved in significantly different classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators to complete these requirements.

Licensure

Upon successful completion of the Graduate Certificate, candidates will be recommended for the North Carolina initial Standard Professional I teaching license. For this license, candidates are required to complete an electronic licensure portfolio that is created during coursework and student teaching. Earning a passing score on the required PRAXIS II test is also mandatory for the licensure

recommendation. Additional information on this test is available on www.ets.org/praxis.

EDUCATIONAL LEADERSHIP AND SCHOOL ADMINISTRATION

- **Ed.D. in Educational Leadership**
 - Higher Education
 - Learning, Design, and Technology
 - P-12 Superintendency
- **M.Ed. in Educational Leadership**
- **Master of School Administration (MSA)**
- **Post-Master's Certificate in School Administration**
- **Post-Master's Certificate in University and College Teaching**
- **Graduate Certificate in Applied Behavior Analysis**

Department of Educational Leadership
edld.charlotte.edu

Ed.D. in Educational Leadership

The Ed.D. in Educational Leadership is designed to prepare educational administrators who can assume mid-level and senior-level leadership positions in public school and post-secondary settings. The program includes three concentrations: (1) Higher Education, (2) Learning, Design, and Technology, and (3) P-12 Superintendency.

Graduates of the program are prepared to:

- 1) Exhibit a broad understanding of their roles as educational leaders in the organizations they serve
- 2) Demonstrate leadership competencies and skills necessary to accomplish the goals of complex organizations
- 3) Interact successfully with the numerous institutions and interests that influence their organizations
- 4) Understand theoretical concepts that undergird organizational theory and behavior, leadership, social psychology, policy, educational administration, and research
- 5) Address issues that face educational leaders, including resource acquisition and management; policy development and analysis; program management; community relations; curriculum development; and personnel selection, development, and evaluation

Admission Requirements

Fall Semester Admission

- 1) The Ed.D. program only admits for the fall semester. The program is competitive and applicants are encouraged to apply early. Carefully review the following information so that all the requested application materials are received by the posted deadlines.
- 2) Completed applications (including all transcripts, recommendations, and optional test scores) submitted by the priority deadline receive the highest departmental consideration for available funding such as assistantships and fellowships. Applications are reviewed beyond these dates based on space availability.
 - January 15 - Priority deadline
 - March 1 - Secondary deadline

Application Submission

All application materials are submitted electronically through the UNC Charlotte Graduate School application system. Applications cannot be forwarded to the Ed.D. program until all supporting documentation has been received by the Graduate School.

Contact gradcounselor@uncc.edu regarding application questions.

Graduate School Requirements

1. Bachelor's degree or its U.S. equivalent
2. GPA 3.0 in the bachelor's degree program. 3.5 in the master's degree program. (Both on a 4.0 scale.)
3. A statement of purpose (essay)
4. At least three recommendations
5. Unofficial transcripts of all academic work
6. TOEFL or IELTS for non-native English language holders

Ed.D. Requirements

1. Test scores: GRE & MAT test scores (optional)
2. Writing Sample: Inclusion of a writing sample such as thesis, paper, research publication, or other best evidence of academic writing
3. Bachelor's Degree Transcript: Requires bachelor's transcript from an accepted accredited college or university
4. Master's Degree Transcript: Requires master's degree from an accepted accredited college or university
5. All concentrations will require at least three years of relevant work experience.
 - PK-12: At least three years of relevant work experience in formal school leadership
 - Higher Education: At least three years of relevant work experience in higher education
 - Learning, Design and Technology: At least three years of relevant work experience in learning, design and technology
6. CV or Résumé: Applicants are required to submit a current CV or résumé.

7. Interview: Top applicants are invited for an interview with faculty prior to a final decision being made regarding a recommendation for admission.
 - The interview is followed by a brief writing prompt that is submitted to the faculty for review.

Interview and Writing Prompt (selected applicants)

Selected applicants are invited to a 30-minute interview with faculty. This is an opportunity to learn more about an applicant's doctoral research interests, career plans, and to ask programmatic questions. The interview is followed by a brief writing prompt that is submitted to the faculty.

Additional Requirements for P12 (School and District Leadership)

In addition to all the above requirements, P12 School and District Leadership applicants must satisfy the following requirements:

1. Writing Sample: Inclusion of a writing sample such as thesis, paper, research publication, or other best evidence of academic writing
OR respond to the following writing prompt:
How should a school district leader go about leading change initiatives? Responses limited to 2 pages (single-spaced) or 4 pages (double-spaced).
2. "M" level licensure is required for admission.

Degree Requirements

The Ed.D. program consists of a minimum of 48 credit hours beyond the master's degree. Students select one of three concentrations.

Higher Education Concentration

The Concentration in Higher Education is designed for those interested in careers as senior-level leaders in post-secondary settings, including higher education, adult education, and research. To ensure the effectiveness and competence of individuals in such positions, coursework within the program is comprised of foundational work in educational leadership, research, and higher education with further specialization available in adult education or educational research. Prospective students should already have a Master's degree in an appropriate and related field. They are neither required to hold North Carolina P-12 licensure nor will any license or certificate be recommended upon graduation.

Foundation Courses (12 credit hours)

ADMN 8110 - Organization Theory and Behavior (3)
ADMN 8181 - Values & Integrative Leadership Practices (3)
ADMN 8610 - Interdisciplinary Seminar (3)
ADMN 8611 - Applied Dissertation Pre-Proposal Development (3)

Concentration Courses (15 credit hours)

Select from the following:

ADMN 8000 - Topics in Educational Leadership (1 to 6)
ADMN 8170 - Introduction to the Community College (3)
ADMN 8171 - The American College Student (3)
ADMN 8172 - Higher Education in the United States (3)
ADMN 8173 - Legal Issues in Higher Education (3)
ADMN 8174 - Higher Education Finance and Budgeting (3)
ADMN 8175 - Non-Traditional Approaches to Higher Education (3)
ADMN 8176 - Women in Higher Education (3)
ADMN 8177 - Student Affairs in Higher Education (3)
ADMN 8178 - Higher Education Policy and Governance (3)
ADMN 8179 - Contemporary Issues in Higher Education (3)
ADMN 8180 - Teaching Strategies for Adults in a Diverse Society (3)
ADMN 8190 - Curriculum in Higher Education (3)

Research Courses (12 credit hours)

RSCH 8110 - Descriptive and Inferential Statistics (3)
or RSCH 8111 - Qualitative Research (3)
RSCH 8120 - Advanced Statistics (3)
or RSCH 8121 - Qualitative Data Collection and Analysis (3)
RSCH 8196 - Program Evaluation Methods (3)
RSCH 8210 - Applied Educational Research (3)

Proposal Design Course (3 credit hours)

Students take this course only after all coursework is completed or during the final semester of coursework.

ADMN 8699 - Dissertation Design Seminar (3)*

Dissertation Course (6 credit hours)

Students must take a minimum of six credit hours of ADMN 8999 only after all other coursework in the program is completed, beginning with the semester following ADMN 8699. Students must maintain continuous enrollment in ADMN 8999 until degree completion and must be enrolled during the semester in which they graduate. Failure to maintain continuous enrollment in ADMN 8999 will result in dismissal from the program.

ADMN 8999 - Dissertation (3)

Students must complete and defend an applied dissertation focused on a specific problem or question relevant to their specialization. Defense of their dissertation is conducted in a final oral examination that is open to members of the University community.

Degree Total = 48 Credit Hours

Learning, Design, and Technology Concentration

The Concentration in Learning, Design, and Technology is designed for those interested in careers as senior-level

leaders in Learning, Design, and Technology positions in higher education, K-12, corporate, government or military settings. To ensure the effectiveness and competence of individuals in such positions, coursework within the program is comprised of foundational work in educational leadership, research, and learning, design, and technology specialization courses. Prospective students should already have a Master's degree in an appropriate and related field. They are not required to hold North Carolina P-12 licensure.

Foundation Courses (12 credit hours)

ADMN 8110 - Organizational Theory and Behavior (3)
 ADMN 8181 - Values & Integrative Leadership Practices (3)
 ADMN 8610 - Interdisciplinary Seminar (3)
 ADMN 8611 - Applied Dissertation Pre-Proposal Development (3)

Concentration Courses (15 credit hours)

Concentration Courses

Required (1) ADMN 8695 Advanced Seminar in Teaching and Learning and (2) ELDT 8102 Research in Learning, Design, and Technology. Select three ELDT courses from the concentration offerings:

ADMN 8125 - Doctoral Seminar in Instruction (3)
 ADMN 8171 - The American College Student (3)
 ADMN 8660 - Instructional Leadership Seminar (3)
 ADMN 8695 - Advanced Seminar in Teaching and Learning (3)
 ELDT 8000 - Topics in Learning, Design, and Technology (1 to 6)
 ELDT 8100 - Foundations of Learning, Design, and Technology (3)
 ELDT 8102 - Research in Learning, Design, and Technology (3)
 ELDT 8110 - Instructional Design (3)
 ELDT 8120 - Current Trends in Learning, Design, and Technology (3)
 ELDT 8121 - Advanced Instructional Design (3)
 ELDT 8130 - Instructional Multimedia Development (3)
 ELDT 8135 - Learning Media, Resources and Technology (3)
 ELDT 8140 - Instructional Video Development (3)
 ELDT 8150 - Design, Development, and Evaluation of Online Learning Systems (3)
 ELDT 8145 - Visual Design of Instructional Products (3)
 ELDT 8160 - Designing Learning Systems with Simulation and Game Technology (3)
 ELDT 8170 - Human Performance Technology (3)
 ELDT 8180 - LDT Project Management and Team Leadership (3)

Research Courses (12 credit hours)

RSCH 8110 - Descriptive and Inferential Statistics (3)
 or RSCH 8111 - Qualitative Research Methods (3)
 RSCH 8120 - Advanced Statistics (3)
 or RSCH 8121 - Qualitative Data Collection and Analysis (3)
 RSCH 8196 - Program Evaluation Methods (3)
 RSCH 8210 - Applied Research Methods (3)

Proposal Design Course (3 credit hours)

Students may take the following course only after all coursework is completed or during the final semester of coursework:

ADMN 8699 - Dissertation Proposal Seminar (3)

Dissertation Course (6 credit hours)

Students must take a minimum of six credit hours of ADMN 8999 only after all other coursework in the program is completed, beginning with the semester following ADMN 8699. Students must maintain continuous enrollment in ADMN 8999 until degree completion and must be enrolled during the semester in which they graduate. Failure to maintain continuous enrollment in ADMN 8999 will result in dismissal from the program.

Students must complete and defend an applied dissertation focused on a specific problem or question relevant to their specialization. Defense of their dissertation is conducted in a final oral examination that is open to members of the University community.

ADMN 8999 - Dissertation Research (3)

Degree Total = 48 Credit Hours

P-12 Superintendency Concentration

The Concentration in P-12 Superintendency is designed to serve the needs of those interested in the study of issues regarding the administration of P-12 public and private educational institutions. These students pursue careers as superintendents and senior-level administrators. In addition to the program requirements regarding leadership experiences, prospective students must hold a Master of School Administration, Master of Education in Curriculum Supervision, Master of Education in Instructional Technology, or a comparable degree. These students must already have a valid "M" level certificate in an appropriate field. Students in the Concentration in P-12 Superintendency are eligible to be recommended for a School Administrator-Superintendent license at the doctoral level upon successful completion of the program. A Concentration in P-12 Superintendency may be chosen by working with the advisor and selecting the appropriate courses and experiences.

Foundation Courses (12 credit hours)

ADMN 8110 - Organization Theory and Behavior (3)
 ADMN 8181 - Values & Integrative Leadership Practices (3)
 ADMN 8610 - Interdisciplinary Seminar (3)
 ADMN 8611 - Applied Dissertation Pre-Proposal Development (3)

Concentration Courses (18 credit hours)

ADMN 8120 - Rethinking Education Reform: Law, Policy, and Public Schools (3)

ADMN 8125 - Doctoral Seminar in Instruction (3)

ADMN 8140 - School Finance (3)

ADMN 8150 - Human Resources and Development (3)

ADMN 8410 - Advanced Internship in Educational Leadership Part 1 (3)

ADMN 8420 - Advanced Internship in Educational Leadership Part 2 (3)

Research Courses (9 credit hours)

RSCH 8110 - Descriptive and Inferential Statistics (3)
or RSCH 8111 - Qualitative Research (3)

RSCH 8196 - Program Evaluation Methods (3)

RSCH 8210 - Applied Educational Research (3)

Proposal Design Course (3 credit hours)

ADMN 8699 - Dissertation Design Seminar (3)

Dissertation Course (6 credit hours)

Students must take a minimum of six credit hours of ADMN 8999 only after all other coursework in the program is completed, beginning with the semester following ADMN 8699. Students must maintain continuous enrollment in ADMN 8999 until degree completion and must be enrolled during the semester in which they graduate. Failure to maintain continuous enrollment in ADMN 8999 will result in dismissal from the program.

ADMN 8999 - Dissertation (3)

Students must complete and defend an applied dissertation focused on a specific problem or question relevant to their specialization. Defense of their dissertation is conducted in a final oral examination that is open to members of the University community.

Internship

All P-12 Superintendency concentration students seeking licensure are required to complete an internship in a P-12 school district. The internship is based upon identified objectives and organizational areas within the school system of the internship assignment. Students are also required to complete electronic key evidences related to vision, staffing, resources, instruction/learning, and governance.

Degree Total = 48 Credit Hours

Advising

Doctoral students have the benefit of three phases of advising as they pursue their degree.

Phase I

Higher Education Concentration

The doctoral coordinator or an assigned faculty member serves as the advisor when students enter the program. During this phase, the advisor plans a course of study with students during the initial stages of the program. A Program Planning Sheet is used to document tentative plans for projected coursework. The planning sheet should be kept by the student and a copy should be provided to the advisor.

Learning, Design, and Technology Concentration

Doctoral students have the benefit of two phases of advising as they pursue their degree. The doctoral coordinator or an assigned faculty member serves as the advisor when students enter the program. During this phase, the advisor plans a course of study with students during the initial stages of the program. Degree works is used to guide the advising process. A program planning sheet is used to document tentative plans for projected coursework. This advisor serves as a guide through the completion of the coursework. This advisor also serves as the coordinator of the process to complete the Portfolio Requirements. This advisor, in consultation of the student, has the responsibility for creating a "portfolio committee" that is made up of the faculty who prepares and evaluates the written and oral comprehensive portfolio requirements. (See Portfolio requirements.) This advisor also helps the student identify faculty whose research interests and expertise are congruent with the student's probable area of inquiry for the dissertation

P-12 Superintendency Concentration

Students follow the cohort model. All coursework, electronic evidences, formation of dissertation committee, proposal defenses, internships, and dissertation defense are scheduled. The Graduate Program Director advises all students.

Phase II

Higher Education Concentration

By the end of the first year of the program, students select a "program advisor" to serve as a guide through the completion of the coursework. This person also serves as the coordinator of the process to complete the Qualifying Examination. This advisor also helps the student identify faculty whose research interests and expertise are congruent with the student's probable area of inquiry for the dissertation. This advisor, in consultation of the student, has the responsibility for creating a "doctoral committee" that is made up of the faculty who prepares and evaluates the written and oral comprehensive qualifying exam. (See *Qualifying Examination section*.)

The responsibility of the doctoral committee members includes:

- 1) Approval of the student's course of study
- 2) Approval of the dissertation proposal
- 3) Evaluation of the final dissertation and oral defense

Learning, Design, and Technology Concentration

Upon successful completion of the portfolio requirements, students are recommended for admission to candidacy. They may then select a dissertation advisor and a dissertation committee and complete a "Change of Advisor Form," if needed. These committee members are appointed to serve on the committee with mutual consent between the student and each faculty member. The committee consists of four members of the Graduate Faculty: the Department of Educational Leadership Chairperson, two other members from the department, and one member appointed by the Graduate School from outside the Department of Educational Leadership.

The purpose of this process is to provide students with an opportunity to develop a direct working relationship with several faculty members. At the same time, it provides an individualized and personalized approach to the advising process. For example, some students may choose to keep the same faculty member to serve as both the program advisor and the dissertation advisor. Likewise, the doctoral committee and the dissertation committee could include some or all of the same faculty.

P-12 Superintendency Concentration

Students follow the cohort model course offering. They select a research topic and dissertation chair within the first year of the program.

Phase III***Higher Education Concentration***

Upon successful completion of the Qualifying Examinations, students are recommended for admission to candidacy. They may then select a dissertation advisor and a dissertation committee and complete a "Change of Advisor Form," if needed. These committee members are appointed to serve on the committee with mutual consent between the student and each faculty member. The committee consists of four members of the Graduate Faculty: the Department of Educational Leadership Chairperson, two other members from the department, and one member appointed by the Graduate School from outside the Department of Educational Leadership.

The purpose of this process is to provide students with an opportunity to develop a direct working relationship with several faculty members. At the same time, it provides an individualized and personalized approach to the advising process. For example, some students may choose to keep the same faculty member to serve as both the program advisor and the dissertation advisor. Likewise, the doctoral committee and the dissertation committee could include some or all of the same faculty.

**Qualifying Examination/Portfolio
Requirement/Key Electronic Evidences**
Higher Education Concentration

Students are required to successfully pass a written and oral examination. The examination is based upon the core areas of the respective specializations.

Learning, Design and Technology Concentration

In addition to coursework and the dissertation, students must complete a portfolio of achievements related to the focus areas of learning, design, and technology. This portfolio must receive satisfactory ratings from the Portfolio Review Committee and serves as the qualifying examination. Example products in this portfolio include: 1) an applied instructional design project, 2) research based paper, and 3) a research project proposal. Students present this portfolio in an oral presentation to the Portfolio Review Committee. Students have to successfully submit and present the portfolio before they can enroll in the dissertation proposal seminar course.

P-12 Superintendency Concentration

Students must score proficient on five electronic key evidences (Vision, Staffing, Resources, Instruction/Learning, and Governance) required for the School Administrator - Superintendent license.

**Application for Degree and Application for
Candidacy**

Students may submit an Application for Degree and an Application for Candidacy during the semester in which they successfully defend their dissertation proposal. Adherence to Graduate School deadlines is expected. Degree requirements are completed when a student successfully defends the dissertation and files the final copy of the dissertation in the Graduate School.

M.Ed. in Educational Leadership

The M.Ed. in Educational Leadership is designed to prepare highly competent leaders for the P-20 education environment, particularly school systems, community colleges, and universities. To achieve its objectives, the program is designed to attract high-quality students and help them develop specific competencies to contribute to a variety of educational settings.

Today, educational leaders in the P-12 and higher education settings must be able to elicit support and create educational environments that foster creativity, change, and innovation that will educate diverse populations in American education. To meet this challenge, the M.Ed. program focuses on leadership development.

The M.Ed. program provides for 30 credit hours of classroom study. The program faculty work with individual students to design a course-taking strategy

applicable to individual goals to best leverage the available curriculum for professional pursuits.

Program Objectives

The major educational objectives of the program are to develop educational leaders who have advanced knowledge and skills by:

- 1) Encouraging participants in the program to self-direct their personal and professional growth as educators by:
 - a) Taking responsibility for their own learning;
 - b) Initiating professional inquiry through conversations with colleagues;
 - c) Critically reading professional literature;
 - d) Participating in personal and professional development opportunities; and
 - e) Setting high expectations for their professional performance.
- 2) Guiding participants to promote in P-20 students and education professionals the skills to respond effectively to student differences by:
 - a) Developing and advanced understanding of human development;
 - b) Expecting and respecting diversity among individuals in educational settings;
 - c) Promoting understanding and respect for all members of the educational community;
 - d) Helping students, stakeholders, and colleagues develop a global perspective; and
 - e) Applying their knowledge at all levels of interaction with students by creating educational environments where all individuals feel welcome as leaders and successful learners.
- 3) Improving educational practice through self-reflection, self-evaluation, and applied research by:
 - a) Engaging in study that leads to continuous improvement of educational leadership;
 - b) Actively investigating and solving educational problems through data gathering and assessment;
 - c) Continuously monitoring the learning problems and successes of each learner;
 - d) Making appropriate adjustments in practice based on analysis of data.
- 4) Serving as educational leaders by:
 - a) Actively participating as leaders in areas in which they can contribute to solving educational problems: schools, school districts, community colleges, universities, and affiliated organizations;
 - b) Taking responsibility for sharing in decision-making relative to institutional issues;
 - c) Readily asking for and sharing successful instructional approaches and solutions with colleagues, supervisors, and educational leaders; and
 - d) Providing mentoring for students and colleagues.

Admission Requirements

In order to be considered for admission to the M.Ed. program, applicants are expected to submit an online application through the Graduate School and meet the following requirements:

- 1) Bachelor's degree (or its U.S. equivalent) from a college or university accredited by an accepted accrediting body.
- 2) GPA 3.0 (on a 4.0 scale). If an applicant has earned or attempted a post-baccalaureate degree (i.e., master's, doctoral, or other), grades in that program will also be taken into consideration.
- 3) A Statement of Purpose (essay) submitted online as part of the application submission process.
- 4) At least three recommendation forms from persons familiar with your personal, academic and/or professional qualifications. These Recommendations are submitted directly from your recommender via the online application system.
- 5) Unofficial transcripts of all academic work attempted beyond high (secondary) school can be used for admission review. An official (officially certified) final transcript must be submitted if an applicant is offered admission. International transcripts provided in a language other than English should be uploaded, but a translated version should be uploaded as well.
- 6) A description of previous relevant employment.
- 7) Reports of GRE/GMAT test scores (optional).
- 8) For non-native English language holders: official English Language Proficiency Scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). Required is either a minimum score of 83 on the Internet-based TOEFL, or a minimum overall band score of 6.5 on the IELTS.

Priority application deadlines are March 1 for Fall admission and October 1 for Spring admission.

Degree Requirements

The M.Ed. in Educational Leadership program requires 30 credit hours, including 9 credit hours of professional education core courses, 15 credit hours of coursework in educational leadership, and 6 credit hours of elective courses. Students are encouraged to work with advisors to select courses relevant to their professional interests (P-12 or Higher Education). M.Ed. completers must successfully prepare an electronic portfolio housing appropriate artifacts and evidences under the direction of program faculty.

Core Courses (9 credit hours)

ADMN 6100 - Fundamentals of Educational Leadership (3)
 ADMN 6101 - Perspectives on Adult Learning Theory (3)
 RSCH 6101 - Research Methods (3)

Educational Administration and Leadership Courses (15 credit hours)

Select from the following:

ADMN 6000 - Topics in Educational Administration (1 to 6)
 ADMN 6105 - Legal Aspects of Schooling (3)
 ADMN 6120 - Instructional Leadership (3)
 ADMN 6130 - Supervision of Instruction (3)
 ADMN 6140 - Curriculum Leadership (3)
 ADMN 6170 - Introduction to the Community College (3)
 ADMN 6171 - The American College Student (3)
 ADMN 6172 - Higher Education in the United States (3)
 ADMN 6173 - Legal Issues in Higher Education (3)
 ADMN 6174 - Higher Education Finance and Budgeting (3)
 ADMN 6175 - Non-Traditional Approaches to Higher Education (3)
 ADMN 6176 - Women in Higher Education (3)
 ADMN 6177 - Student Affairs in Higher Education (3)
 ADMN 6178 - Higher Education Policy and Governance (3)
 ADMN 6179 - Contemporary Issues in Higher Education (3)
 ADMN 6180 - Teaching Strategies for Adults in a Diverse Society (3)
 ADMN 6190 - Curriculum in Higher Education (3)
 ELDT 5100 - Technology Integration in Education (3)
 RSCH 7196 - Program Evaluation Methods (3)

Elective Courses (6 credit hours)

Select from the following with input from the advisor. - Courses from other departments may be selected with advisor and department approval.

ADMN 6430 - Internship and Professional Development in Higher Education (3)
 ADMN 6XXX - Educational Leadership/School Administration Elective Course (3)
 ELDT 6XXX - Education: Learning, Design, and Technology Elective Course (3)
 RSCH 6XXX - Educational Research, Measurement, and Evaluation Elective Course (3)

Degree Total = 30 Credit Hours

Master of School Administration (MSA)

The mission of the Master of School Administration (M.S.A.) program is to prepare innovative, collaborative, effective, and reflective leaders who are prepared to develop school environments that ensure equitable and quality learning opportunities for a rapidly changing and increasingly diverse population and that focus on improving the learning for all students in the 21st century.

Program graduates qualify for a PreK-12, Level 1 School Administrator's license (Principal).

Program Objectives

Program objectives are aligned with the approved national standards of the Educational Leaders Constituent Consortium, the North Carolina Department of Public Instruction, the National Council for Accrediting Teacher Education, and the State Board of Education's Standards for School Executives. In particular, there are six basic standards that serve as core curriculum components:

- 1) Visioning for school improvement
- 2) Creating a positive school culture, providing an effective instructional program, and designing comprehensive professional growth plans
- 3) Managing the organization
- 4) Collaborating with families and community, responding to diverse interests and needs
- 5) Acting with integrity, fairly, and equitably
- 6) Interacting and influencing the larger political, social, economic, legal, and cultural context

Admission Requirements

In addition to the general requirements for admission to the Graduate School, applicants must:

- Have a minimum of three years of successful teaching or other professional education experience
- Hold a Class A North Carolina educator license or equivalent
- Submit a 1-2 page personal statement that addresses professional experiences, future goals, and an understanding that school administrators must possess a comprehensive conceptual, pedagogical, and reflective knowledge base
- Submit a complete résumé showing evidence of leadership
- Submit a copy of the educator license
- Submit three letters of recommendation from school administrators (must include principal) who can attest to your potential success as a school principal
- Submit GRE or GMAT test scores (*optional*)

Application deadline is January 1 for applicants applying to the North Carolina Principal Fellows Program. Application deadline is April 1 for enrollment in the master's degree program and the graduate certificate program.

Admission decisions are based on an analysis of applicant profiles made by program faculty and clinical instructors. Applicants with the highest profile rankings are invited to participate in interviews. Program faculty, clinical faculty, school district central office personnel, acting principals/assistant principals, and program graduates serve on interview teams. These interviews are designed to

provide the applicant an opportunity to show evidence of academic strengths, leadership potential, and personal characteristics. After the interview, the applicant will provide a writing sample from a given prompt.

The Graduate School will notify applicants of their admission status.

Degree Requirements

The M.S.A. program requires a total of 36 credit hours in a combination of courses in educational leadership, research, technology, curriculum, and instruction. All students must complete the required academic year-long internship under the direction of a principal-mentor and a University supervisor. The internship challenges students to demonstrate a thorough and well-integrated understanding of the basic principles, research findings, and theories covered in their coursework and apply these to educational practice and leadership situations.

ADMN 6100 - Fundamentals of Educational Leadership (3)
 ADMN 6105 - Legal Aspects of Schooling (3)
 ADMN 6110 - School Leadership and Management (3)
 ADMN 6120 - Instructional Leadership (3)
 ADMN 6130 - Supervision of Instruction (3)
 ADMN 6161 - The Principalship (3)
 ADMN 6410 - Internship and Seminar Part I (3)
 ADMN 6420 - Internship and Seminar Part II (3)
 ADMN 6490 - Internship and Seminar: Administration(3)
 ADMN 6491 - Internship and Seminar: Supervision (3)
 ELDT 5100 - Technology Integration in Education (3)
 RSCH 6101 - Research Methods (3)

Degree Total = 36 Credit Hours

Capstone Experiences

The year-long internship requires the productive application of knowledge, skills, and dispositions, to the problems of practice. The experience provides a multitude of opportunities for the intern to progressively develop administrative competence. Interns are guided through their experience by their school-site mentor and University clinical supervisor.

Additionally, the M.S.A. and the graduate certificate program completers seeking a North Carolina principal level I license must successfully prepare an electronic portfolio housing appropriate artifacts and evidences demonstrating their proficiency in all seven standards for school executives. As of 2010, candidates seeking a North Carolina Principal's license will no longer take the SLLA (School Leaders Licensure Assessment) from ETS. The assessment to determine licensure has been replaced with the E-Portfolio.

Principal Fellows

Each year a limited number of scholarship/loans for persons seeking an M.S.A. as full-time students are available from the North Carolina Principal Fellows Program (ncfpj.northcarolina.edu). The program is funded by the North Carolina General Assembly to help highly qualified persons study school administration on a full-time basis.

Post-Master's Certificate in School Administration

Students seeking to "add-on" the *Certificate in School Administration* to a previous master's degree must complete 21 credit hours, of which a portion is a supervised year-long internship.

Admission Requirements

To be eligible and to apply for this program, applicants must:

- Hold a master's degree from a college or university accredited by an accepted accrediting body
- Have a cumulative grade point average of at least 3.2 in all previously completed graduate degree coursework
- Have three years of successful teaching experience or other professional education experience
- Submit a complete résumé
- Submit a valid NC educator license or equivalent
- Submit three letters of reference from current or past supervisors (must include principal) that document leadership and administrative experiences and potential for success as a site-based school administrator
- Submit a 1-2 page personal statement that addresses professional experiences, future goals, and an understanding that school administrators must possess a comprehensive conceptual, pedagogical, and reflective knowledge base
- Follow all admission guidelines established by UNC Charlotte's Graduate School

Certificate Requirements

Required Courses (21 credit hours)

ADMN 6100 - Fundamentals of Educational Leadership (3)
 ADMN 6105 - Legal Aspects of Schooling (3)
 ADMN 6120 - Instructional Leadership (3)
 ADMN 6130 - Supervision of Instruction (3)
 ADMN 6161 - Principalship (3)
 ADMN 6410 - Internship and Seminar Part I (1-9)
 ADMN 6420 - Internship and Seminar Part II (1-9)

Optional Courses (these do not count toward certificate completion)

ADMN 6490 - Internship and Seminar: Administration (3-6)

ADMN 6491 - Internship and Seminar: Supervision (3-6)

Certificate Total = 21 Credit Hours

Post-Master's Certificate in University and College Teaching

*****This is a Distance Education program.*****

The Post-Master's Certificate in University and College Teaching prepares graduate students, postdoctoral scholars, current faculty, and others with the skills needed for the full range of faculty responsibilities at institutions of higher education.

Admission Requirements

- Master's degree from a college or university accredited by an accepted accrediting body or pursuing a doctoral degree
- GPA of at least 2.75 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school) *(For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL))*
- Online application through the Graduate School's application system
- Statement of purpose
- Unofficial transcripts of all college coursework attempted

Certificate Requirements

Required Courses (12 credit hours)

ADMN 8171 - The American College Student (3)

ADMN 8695 - Advanced Seminar in Teaching and Learning (3)

ELDT 8150 - Design, Development, and Evaluation of Online Learning Systems (3)

GRAD 8201 - Teaching at the University Level (2 to 3)
or EDCI 8681 - Seminar in College Teaching (3)

Certificate Total = 12 Credit Hours

EDUCATIONAL RESEARCH, MEASUREMENT, AND EVALUATION

- Ph.D. in Educational Research, Measurement, and Evaluation
- Graduate Certificate in Quantitative Analyses
- Post-Master's Certificate in Qualitative Research

Department of Educational Leadership
edld.charlotte.edu

Ph.D. in Educational Research, Measurement, and Evaluation

The doctoral program at UNC Charlotte prepares professionals who seek advanced research, statistical, and evaluation skills for positions in a wide variety of educational institutions including higher education, K-12 school districts, for-profit companies, nonprofit agencies, community colleges, think tanks, government organizations, and other institutions concerned with solving problems in education.

The program builds on the Master of Education (M.Ed.) or comparable program. The 60-credit Ph.D. program includes 9 credit hours in foundations, 21 credit hours in research methodology and data analyses, 15 credit hours in a major area of focus, 6 credit hours in internship, and 9 credit hours in dissertation design and study. Additional coursework may be required for students who do not have a foundation in research.

Admission Requirements

Applications for admission are accepted twice a year to begin doctoral studies in the Fall or Spring semester.

The following documents/activities must be submitted in support of the application:

- Official transcript(s) of all academic work attempted since high school indicating a GPA of 3.5 (on a scale of 4.0) in a graduate degree program*

- Official report of score on the GRE or MAT that is no more than 5 years old*
- At least three references* of someone who knows the applicant's current work and/or academic achievements in previous degree work
- A two page essay describing prior educational and research experiences and objectives for pursuing doctoral studies*
- A current resume or vita
- A professional writing sample (e.g., published article, manuscript submitted for publication, term paper submitted in prior coursework, abstract of thesis, teaching manual)
- International students must submit official and acceptable English language proficiency test scores on the Test of English as a Foreign Language (TOEFL), the Michigan English Language Assessment Battery (MELAB), or the International English Language Testing System (IELTS). All tests must have been taken within the past two years**

**These items are required of applicants to any of UNC Charlotte's doctoral programs.*

***See the Graduate School's website for minimum acceptable scores.*

Students are admitted for either full-time study or intensive part-time study and begin in the Fall or Spring semester. Students must complete their degree, including the dissertation, within nine years. The minimum time for completion for a full-time student is 3 years.

Degree Requirements

Core Courses (9 credit hours)

EDCI 8180 - Critical Issues and Perspectives in Urban Education (3)
RSCH 8196 - Program Evaluation Methods (3)
RSCH 8210 - Applied Research Methods (3)

Research Methods and Advanced Content Courses (21 credit hours)

RSCH 8110 - Descriptive and Inferential Statistics (3)
RSCH 8111 - Qualitative Research Methods (3)
RSCH 8120 - Advanced Statistics (3)
RSCH 8121 - Qualitative Data Collection and Analysis (3)
RSCH 8140 - Multivariate Statistics (3)
RSCH 8197 - Design and Analysis of Experimental and Quasi-Experimental Evaluations (3)
RSCH 8220 - Educational and Psychological Measurement (3)
or RSCH 8230 - Theory and Applications of Measurement (3)

Major Area of Focus Courses (15 credit hours)

Students select an area of specialization in the research degree program. This offers students the opportunity to

develop advanced expertise in an area relevant to their future professional research practice. The 15-credit hour area of focus is approved by the student's advisor and Graduate Program Director and must be aligned to the themes found in Educational Research, Measurement, and Evaluation. The most common areas of expertise include Educational Measurement, Educational Evaluation, Educational Research Methodology, and Applied Research in specific educational content areas. Commonly offered RSCH courses are listed here. Graduate level courses selected from ADMN, EDCI, RSCH, EIST, PSYC, PPOL, or SOCY may be applied.

RSCH 8112 - Survey Research Methods (3)
 RSCH 8113 - Single-Case Research (3)
 RSCH 8150 - Structural Equation Modeling (3)
 RSCH 8160 - Hierarchical Linear Models in Education (3)
 RSCH 8220 - Educational and Psychological Measurement (3)
 RSCH 8230 - Theory and Applications of Measurement (3)

Internship (6 credit hours)

Three credit hours of RSCH 8410 are required. The remaining three credit hours can be met with either RSCH 8410 or RSCH 8411.

RSCH 8410 - Internship in Educational Research (3)
 RSCH 8411 - Internship in Teaching Educational Research (3)

Proposal Design (3 credit hours)

RSCH 8699 - Dissertation Proposal Design (3)

Dissertation (minimum 6 credit hours)

RSCH 8999 - Doctoral Dissertation Research (1 to 9)

The purpose of the dissertation is for doctoral students to demonstrate their ability to synthesize the professional literature and generate new knowledge for the profession through using well-established research tools. For the Ph.D. in Education Research, Measurement, and Evaluation Education, the dissertation may be quantitative, qualitative, or mixed methods. Whatever type of design, it must adhere to current standards for quality as reflected in professional writing on the chosen method of research design and reflected in the current literature. Students are also permitted to select the three-article dissertation format in consultation with their advisor. Students must be continuously enrolled for dissertation research credits through and including the semester of graduation. Defense of the dissertation is conducted in a final oral examination that is open to the University community.

Portfolio Requirement

In addition to coursework and the dissertation, students must complete a portfolio that serves as a Qualifying Examination and includes demonstration of writing,

collaboration, and research skills. Students receive opportunities to build this portfolio through the research and practice coursework. Products in the portfolio include: reflective statement, literature review, empirical journal article submission, empirical journal article review, conference presentation, and professional organization involvement.

Degree Total = 60 Credit Hours

Application for Degree

Students must submit an Application for Degree during the semester in which they successfully defend their dissertation proposal. Adherence to Graduate School deadlines is expected. Degree requirements are completed when students successfully defend their dissertation and file the final copy of the dissertation in the Graduate School.

Transfer Credit

The program accepts up to two courses as transfer from a doctoral-granting college or university accredited by an accepted accrediting body providing the Education Research Doctoral Committee determines that the course or courses to be transferred are equivalent to similar courses required in the UNC Charlotte Ph.D. program or fit the specialty area. The grade in these transfer courses must be an A or B. All of the dissertation work must be completed at UNC Charlotte.

Graduate Certificate in Quantitative Analyses

The Graduate Certificate in Quantitative Analyses prepares graduate students, postdoctoral scholars, current faculty, and others with the skills needed for the full range of quantitative analyses used in research.

Admission Requirements

- 1) Official transcript(s) of all academic work attempted since high school indicating a GPA of 3.5 (on a scale of 4.0) in a graduate degree program.
- 2) At least three references of someone who knows the applicant's current work and/or academic achievements in previous degree work.
- 3) A two page essay describing prior educational and research experiences and objectives for pursuing doctoral studies.
- 4) A current resume or vita.
- 5) A professional writing sample (e.g., published article, manuscript submitted for publication, term paper submitted in prior coursework, abstract of thesis, teaching manual).
- 6) A minimum TOEFL score of 220 (computer-based), 557 (paper-based), or 83 (internet based) or a

minimum IELTS band score of 6.5 is required for any applicant whose native language is not English. All tests must have been taken within the past two years.

Certificate Requirements

The graduate certificate program requires 12 credit hours from the following courses:

RSCH 6110 - Descriptive and Inferential Statistics (3)
 RSCH 6120 - Advanced Statistics (3)
 RSCH 7140 - Multivariate Statistics (3)
 RSCH 7160 - Hierarchical Linear Models in Education (3)

Students also enrolled in the Ph.D. in Educational Research, Measurement, and Evaluation should substitute the following courses:

RSCH 8110 - Descriptive and Inferential Statistics (3)
 RSCH 8120 - Advanced Statistics (3)
 RSCH 8140 - Multivariate Statistics (3)
 RSCH 8150 - Structural Equation Modeling (3)
 or RSCH 8160 - Hierarchical Linear Models in Education (3)

Certificate Total = 12 Credit Hours

Post-Master's Certificate in Qualitative Research

The Post-Master's Certificate in Qualitative Research prepares graduate students, postdoctoral scholars, current faculty, and others with the skills needed for the full range of qualitative inquiry methods used in social research.

Admission Requirements

- A master's degree, or its equivalent, from a regionally accredited college or university
- Official transcript(s) of all academic work attempted since high school indicating a GPA of 3.5 (on a scale of 4.0) in a graduate degree program
- An online application through the Graduate School's application system
- Standardized test scores (e.g., GRE, GMAT, MAT) are optional.
- Two letters from references
- Statement of purpose (SOP)
- A current resume or vita
- A professional writing sample
- Applicants whose native language is not English may be required to provide official English proficiency test scores. Refer to the Graduate School's policy on English proficiency.

Certificate Requirements

Required Courses (6 credit hours)

RSCH 8211 – Qualitative Research Methods (3)
 RSCH 8121 – Qualitative Data Collection and Analysis (3)

Elective Courses (6 credit hours)

Students must take two elective courses from the following:

RSCH 8131 – Interviewing as Qualitative Inquiry (3)
 RSCH 8890 – Special Topics in Research (3)
 Other COED/UNC Charlotte courses that cover a specific qualitative method in depth, with approval* (3)

* Note: Other courses must be approved by the certificate coordinator. Doctoral-level qualitative research courses selected from ADMN, EDCI, RSCH, ELDT, HPSY, PSYC, PPOL, or SOCY may be considered.

Grade Requirements

Students must achieve a 3.0 GPA to complete the certificate. No more than one C may count toward the certificate.

Certificate Total = 12 Credit Hours

ELEMENTARY EDUCATION

- **Master of Education in Elementary Education (M.Ed.)** *(for individuals with a bachelor's degree and license in Elementary Education)*
 - Academically or Intellectually Gifted
 - Anti-Racism
 - Elementary Mathematics
 - Literacy
 - Science, Technology, Engineering, and Mathematics (STEM)
- **Master of Arts in Elementary Education (M.A.T.)** *(for individuals with an approved bachelor's degree, not in Elementary Education, who are seeking licensure and a master's degree in Elementary Education or for individuals who have completed the Graduate Certificate)*
- **Graduate Certificate in Teaching - Elementary Education**
- **Graduate Certificate in Elementary Mathematics Education**
- **Graduate Certificate in Instructional Coaching**

Department of Reading and Elementary Education

reel.charlotte.edu

M.Ed. in Elementary Education

**** This program is no longer accepting applications. ****

The M.Ed. in Elementary Education is designed for experienced teachers who wish to become instructional leaders, advanced practitioners, and global educators. Upon completion of the program, students will qualify for the North Carolina advanced Standard Professional II teaching license in Elementary Education.

1) Instructional Leader

This degree program enables graduates to develop leadership skills as well as specialized content knowledge to effectively impact elementary education. Graduates of this program will also be advocates for students' cultural and academic needs as well as advocates for effective and relevant educational practices and policies.

2) Advanced Practitioners

Completion of this degree program will enable graduates to acquire deep theoretical and content knowledge to become advanced practitioners in specific emphasis areas. Graduates will have the capacity to facilitate student learning through inquiry-based practices. Graduates will also possess knowledge and practice that will prepare them to enter Ph.D. programs throughout the country and world.

3) Global Educators

Graduates of this degree program will contribute to a rigorous and critical analysis of learning in their classroom, the school, and global society. The program enables graduates to promote an educational milieu that values culture, reflective practice, and multiple worldviews.

Program Goals

- Master teachers are self-directed and ethical in their personal and professional growth as educators.
 - Master teachers are responsive to children's differences as influenced by development, exceptionalities, and diversity.
 - Master teachers are well-grounded in the technology, content, and pedagogy of the elementary curriculum and emphasis area.
 - Master teachers are effective in urban, rural, and suburban cultural contexts
 - Master teachers are self-reflective, educational advocates, and educational researchers.
 - Master teachers are collaborative and impactful educational leaders.
- Master teachers are globally aware of the impact of local education.

Concentrations

Concentrations available in the M.Ed. in Elementary Education program include:

- Academically or Intellectually Gifted
- Anti-Racism
- Elementary Mathematics
- Literacy
- Science, Technology, Engineering, and Mathematics (STEM)

Admission Requirements

- 1) Official transcripts of all previous academic work beyond high school with a minimum undergraduate GPA of 3.0
- 2) Completion of a Bachelors in Elementary Education from an approved program
- 3) Official reports of GRE or MAT examination
- 4) An essay describing statement of purpose for undertaking graduate study
- 5) Apply online: graduateschool.charlotte.edu

GRE/MAT Waiver

The GRE or MAT requirement is waived for applicants with a cumulative undergraduate GPA of 3.0 or above.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The M.Ed. in Elementary Education is a 30 credit hour online program. The program of study includes 15 credit hours of required core courses, with the remaining credit hours from a selected concentration and elective courses.

Core Courses (15 credit hours)***Phase I. Developing Perspectives (6 credit hours)***

ELED 6200 - Current Issues in Global and Urban Schools (3)

ELED 6202 - Creating Effective Elementary Classroom Environments for All Students (3)

Phase II. Collaborative Inquiry (6 credit hours)

ELED 6203 - Instructional Differentiation for 21st Century Learners (3)

RSCH 6101 - Research Methods (3)

Phase III. Investigative Leadership (3 credit hours)

ELED 6303 - Teacher Inquiry and Data Analysis in the Classroom (3)

Concentration Courses (11-15 credit hours)***Academically or Intellectually Gifted Concentration* (12 credit hours)***

SPED 5211 - Nature and Needs of Gifted Students (3)

SPED 6124 - Methods of Instructing Gifted Students (3)

SPED 6161 - Social and Emotional Needs of Gifted Students (3)

SPED 6224 - Adapting Curriculum Material and Classroom Differentiation (3)

**This concentration leads to the North Carolina Licensure if the student successfully completes all of the related licensure requirements.*

Anti-Racism Concentration* (12 credit hours)

ELED 6260 - Psychological and Historical Influences on Society (3)

ELED 6261 - Human Identity Development (3)

ELED 6262 - Social Dynamics and Systems that Educate (3)

ELED 6263 - Social Action and Advocacy (3)

**This concentration leads to the North Carolina Licensure if the student successfully completes all of the related licensure requirements.*

Elementary Mathematics Concentration* (15-18 credit hours)

ELED 6311 - Number Systems and Operations: K-5 Mathematical Tasks (3)

ELED 6312 - Geometry and Spatial Visualization: K-5 Assessment (3)

ELED 6313 - Algebraic Reasoning: K-5 Discourse and Questioning (3)

ELED 6314 - Rational Numbers and Operations: K-5 Learning Trajectories (3)

ELED 6315 - Data Analysis and Measurement: K-5 Classroom Interactions (3)

Note: - ELED 6316 (Mathematical Modeling: K-5 Leadership) must also be completed in order to earn the North Carolina Add-On License

**This concentration leads to the North Carolina Licensure if the student successfully completes all of the related licensure requirements.*

Literacy Concentration (15 credit hours)

READ 6100 - Trends and Issues in Literacy and Leadership (3)

READ 6204 - Teaching Reading to English Language Learners (3)

READ 6250 - Emergent and Elementary Literacy (3)

READ 6252 - K-12 Writing Development and Instruction (3)

READ 6265 - Multiliteracies in a Global World: Reading and Writing Texts in New Times (3)

Science, Technology, Engineering, and Mathematics (STEM) Education Concentration (15 credit hours)

ELED 6210 - Current Issues in STEM Education (3)

ELED 6211 - Integrating Engineering into the Elementary School Curriculum (3)

ELED 6212 - Integrating Digital Learning and STEM with Elementary School Learners (3)

ELED 6213 - Global Awareness in STEM Education (3)

ELED 6214 - Designing and Developing STEM Curricula (3)

Elective Course (3 credit hours)

An elective course may include any non-required course selected from a variety of graduate-level course offerings within the College of Education, designed to support concentration, additional research courses, and advanced knowledge in specific content. Advisor approval for elective courses must be granted via permit.

Capstone Requirement

The capstone experience for the M.Ed. in Elementary Education is fulfilled by successfully completing the

Teacher Inquiry Project in the ELED 6303 course. Only students in their final semester of coursework are eligible to enroll in ELED 6303.

Degree Total = 30 Credit Hours

Clinical Field Experiences

Students in the M.Ed. program participate in structured field experiences that require them to apply coursework in their classroom settings, analyze K-5 student learning, and reflect on their practice in the context of theories on teaching and learning. Students deepen their understanding of the knowledge, skills, and professional dispositions that foster student learning. These experiences broaden their ability to help all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. These structured field experiences are designed to take place in multiple settings within the candidate's school community or districts, after-school programs, alternate youth centers, or in the schools and classrooms in which the candidates work.

Advising

All students are assigned an advisor upon formal admission to the program. Students are required to attend the advising seminar at the start of each semester.

Licensure

The master's (M.Ed.) program in Elementary Education is a K-6 instructional degree that leads to the "M" level teaching license.

Research Opportunities/Experiences

Faculty members in the Department of Elementary Education faculty are deeply committed to research in urban schools. As a result, candidates will have opportunities to become involved in classroom-based research.

M.A.T. in Elementary Education

The Master of Arts in Teaching (M.A.T.) program is designed for individuals who hold a bachelor's degree. The M.A.T. program is a 31 credit hour program composed of two phases: the Graduate Certificate phase (Phase I, 22 credit hours) and the Master's degree completion phase (Phase II, 9 credit hours). Completion of Phase I leads to the initial Standard Professional I teaching license in Elementary Education. Phase I requires 22 credit hours of coursework, including the graduate student teaching/internship experience. Upon completion of Phase I, qualified candidates may apply for the M.A.T. in Elementary Education (Phase II). The M.A.T. in Elementary Education is a part of the University of North Carolina

Distance Education Consortium (online.northcarolina.edu). Completion of the remaining requirements for the Master's degree (Phase II) qualifies candidates for the advanced Standard Professional II teaching license.

All courses for both phases of the Graduate Certificate/M.A.T. must be completed within seven years. Coursework within Phase I/Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to the information found in The Graduate School section of this *Catalog*.

Admission Requirements for all M.A.T. programs

- 1) Completion of the Graduate Certificate in Teaching
- 2) Minimum graduate GPA of 3.5 in the Graduate Certificate in Teaching in Elementary Education
- 3) Statement of purpose
- 4) Apply online at graduateschool.charlotte.edu

Degree Requirements

Phase I: Graduate Certificate Courses

Required Courses (17 credit hours)

- ELED 5110 - Developing Effective Learning Environments (2)
- ELED 5210 - Essentials of Teaching Mathematics to Elementary School Learners (2)
- ELED 5310 - Teaching and Assessment of Mathematics for Elementary School Learners (3)
- READ 5111 - Essentials of Literacy Instruction (3)
- READ 5211 - Methods of Literacy (3)
- READ 5311 - Literacy Assessment and Tiered Interventions (3)

Internship/Student Teaching (5 credit hours)

The graduate-level student teaching/internship is the culminating experience in Phase I of the M.A.T., offering students the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. It must be taken in the final semester for the initial licensure program. Students are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and University faculty. Residency teachers and teacher assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship experience and licensure requirements. This contact should take place at least one semester before student teaching.

- ELED 6470 - Graduate Student Teaching/Internship in Elementary Education (5)

Phase II: Completion of the M.A.T.***Required Courses (9 credit hours)***

Elementary education courses taken in Phase II of the M.A.T. require employment as an elementary teacher.

ELED 6202 - Creating Effective Elementary Classroom Environments for All Students (3)

ELED 6203 - Instructional Differentiation for 21st Century Learners (3)

ELED 6303 - Teacher Inquiry and Data Analysis in the Classroom (3) *

**ELED 6303 is the Capstone Course and must be taken in the final semester of the program.*

Degree Total = 31 Credit Hours

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisors at least once each semester.

Clinical Field Experiences

All courses require students to develop their knowledge, skills, and dispositions in public school/agency settings.

During Phase I of the program, all students are expected to complete clinical experiences in at least three significantly different settings.

Clinical field experiences provide opportunities for helping all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, students apply theories and understandings gained in coursework, analyze K-6 student learning, and develop the ability to positively impact all learners. Each course in Phase I of the program requires 20 clinical hours. These structured experiences can take place in multiple settings such as neighboring schools or districts, after-school programs, or in the schools and classrooms in which the candidates work. All elementary education courses in Phase II of the program require employment as an elementary teacher as extensive action research is done in the classroom setting.

Candidates who are residency teachers and teacher assistants must move beyond their own classrooms and schools for at least two clinical experiences. Alternative settings must be approved by the instructor. A limited number of clinical experiences may be approved in *significantly different* classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators.

Licensure

Upon successful completion of the Phase I/Graduate

Certificate, teacher candidates will be recommended for the North Carolina Standard Professional I teaching license. For this license, students are required to complete all NC State mandated testing/performance assessment requirements for licensure.

Upon successful completion of Phase II, students will be recommended for the North Carolina advanced Standard Professional II teaching license. For the advanced license, students are required to complete an advanced electronic licensure portfolio during coursework.

Research Opportunities/Experiences

Faculty members in the Department of Reading and Elementary Education are deeply committed to research in urban schools. As a result, candidates will have opportunities to become involved in practical and meaningful classroom-based research.

Graduate Certificate in Teaching: Elementary Education

The Graduate Certificate in Teaching: Elementary Education is a 22 credit hour program designed for students who hold a bachelor's degree. Upon successful completion of the Graduate Certificate, students are eligible for the North Carolina Standard Professional I teaching license.

The required courses for the Graduate Certificate are identical to Phase I of the M.A.T. Upon completion of the Graduate Certificate, qualified students have the option of continuing into Phase II to complete the M.A.T. Admission to the Graduate Certificate is separate and distinct from admission to a graduate degree program and not an indication of automatic admission to the M.A.T. degree program. For more information on this option, refer to the M.A.T. section above.

All courses for the Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to the information found in The Graduate School section of this *Catalog*.

Admission Requirements for all Graduate Certificates in Teaching Programs

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.75. *(For alternative ways to demonstrate academic competence, contact the Office of Teacher*

Education Advising and Licensure (TEAL)

- 3) Two professional references in a supervisory capacity (i.e. principal or manager) and/or academic references (i.e. professor)
- 4) Statement of purpose
- 5) Clear criminal background check
- 6) Apply online at graduateschool.charlotte.edu

Certificate Requirements**Required Courses (17 credit hours)**

- ELED 5110 - Developing Effective Learning Environments (2)
 ELED 5210 - Essentials of Teaching Mathematics to Elementary School Learners (2)
 ELED 5310 - Teaching and Assessment of Mathematics for Elementary School Learners (3)
 READ 5111 - Essentials of Literacy Instruction (3)
 READ 5211 - Methods of Literacy (3)
 READ 5311 - Literacy Assessment and Tiered Interventions (3)

Internship/Student Teaching (5 credit hours)

The graduate-level student teaching/internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. A GPA of 3.0 or above in the graduate certificate coursework is required to be eligible for the student teaching/internship. Students are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and University faculty. Residency teachers and teacher assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship experience and licensure requirements. This contact should take place at least one semester before student teaching. The prerequisite for the student teaching/internship is completion of all program coursework, a GPA of 3.0 or above, an application for the course by the established deadline, and approval of the department.

ELED 6470 - Graduate Student Teaching/Internship in Elementary Education (5) **

*** Must be taken in the final semester for the initial licensure program.*

Certificate Total = 22 Credit Hours**Advising**

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisors at least once each semester.

Clinical Field Experiences

All courses require students to develop their knowledge, skills, and dispositions in public school/agency settings. During the Graduate Certificate in Elementary Education program, all students are expected to complete clinical experiences in at least three significantly different settings.

Clinical field experiences provide opportunities for helping all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, students apply theories and understandings gained in coursework, analyze K-6 student learning, and develop the ability to positively impact all learners. The first semester requires a minimum of 30 hours of clinical experiences. The second semester requires a minimum of 36 hours of clinical experiences. The third semester requires a minimum of 40 hours of clinical experiences. These structured experiences can take place in multiple settings such as neighboring schools or districts, after-school programs, or in the schools and classrooms in which the candidates work or are placed by the Office of School and Community Partnerships.

Candidates who are lateral entry teachers and teacher assistants must move beyond their own classrooms and schools for at least two clinical experiences. Alternative settings must be approved by the instructor. A limited number of clinical experiences may be approved in significantly different classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, teacher candidates will be recommended for the North Carolina Standard Professional I teaching license. For this license, students are required to complete all NC State mandated testing/performance assessment requirements for licensure.

Graduate Certificate in Elementary Mathematics Education

The Graduate Certificate in Elementary Mathematics Education is an 18 credit hour program designed for students who hold a North Carolina Teaching License with either certification in Elementary Education (Grades K-6) **OR** Middle Grades Education (Grades 6-8) and certified in Middle Grades Mathematics.

Upon successful completion of the Graduate Certificate, students are eligible for the North Carolina Add-on License in Elementary School Mathematics.

Upon completion of the Graduate Certificate, qualified students have the option of applying to the M.Ed. in Elementary Education program. Admission to the Graduate Certificate program is separate and distinct from admission to a graduate degree program and not an indication of automatic admission to the M.Ed. degree program. For more information on this option, refer to the M.Ed. section above.

All courses for the Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to the information found in The Graduate School section of this *Catalog*.

Graduate Certificate Program Admission Requirements

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.75 (*For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL)*)
- 3) A North Carolina teaching license in Elementary Education (Grades K-6) **OR** Middle Grades Education (Grades 6-8) and certified in Middle Grades Mathematics
- 4) Three recommendations from persons knowledgeable of the candidate's interaction with children or youth, including a current administrator at the school in which the candidate works
- 5) Clear criminal background check
- 6) Apply online at <http://graduateschool.charlotte.edu>

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Certificate Requirements

ELED 6311 - Number Systems and Operations: K-5 Mathematical Tasks

ELED 6312 - Geometry and Spatial Visualization: K-5 Assessment

ELED 6313 - Algebraic Reasoning: K-5 Discourse and Questioning

ELED 6314 - Rational Numbers and Operations: K-5 Learning Trajectories

ELED 6315 - Data Analysis and Measurement: K-5 Classroom Interactions

ELED 6316 - Mathematical Modeling: K-5 Leadership

Certificate Total = 18 Credit Hours

Clinical Field Experiences

Most courses require students to develop their knowledge, skills, and dispositions in public school/agency settings. *During the Graduate Certificate in Elementary Mathematics Education program, all students are expected to complete clinical experiences in elementary school settings.*

Clinical field experiences provide opportunities for helping all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, students apply theories and understandings gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. Each course in the program requires 20 clinical hours. These structured experiences can take place in multiple settings such as neighboring schools or districts, after-school programs, or in the schools and classrooms in which the candidates work.

Candidates who are residency teachers and teacher assistants must move beyond their own classrooms and schools for at least two clinical experiences. Alternative settings must be approved by the instructor. A limited number of clinical experiences may be approved in *significantly different* classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators.

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisors at least once each semester.

Licensure

Upon successful completion of the Graduate Certificate, students will be recommended for the North Carolina Standard Professional I teaching license. For this license, students are required to complete an electronic licensure portfolio that is created during coursework and student teaching.

Graduate Certificate in Instructional Coaching

The Graduate Certificate in Instructional Coaching is a 12 credit hour program designed for those interested in becoming instructional leaders who facilitate job-embedded professional development in P-12 schools. The required courses develop candidates' knowledge and skills in coaching novice and veteran teachers to improve instruction, design quality curriculum, and effectively use data to guide instruction, as well as determine areas for development.

Admission Requirements

- Undergraduate degree in education or closely related field from a college or university accredited by an accepted accrediting body
- Minimum undergraduate GPA of 2.75
- Three years of successful teaching experience or other professional education experience
- Two letters of reference from current or past supervisors (must include principal) that document leadership and/or administrative experiences and potential for success as an instructional coach
- Personal statement of purpose
- Current resume or CV
- Clear criminal background check

Certificate Requirements

EDUC 5150 - Principles of Coaching I (3)

EDUC 5151 - Coaching for an Equitable Learning Environment (3)

EDUC 5152 - Principles of Coaching II (3)

EDUC 5153 - Application of Coaching Principles (3)

Certificate Total = 12 Credit Hours

Grade Requirements

Students must achieve a minimum 3.0 GPA to complete the certificate. No more than one grade of C may count towards the certificate.

FOREIGN LANGUAGE EDUCATION

• Master of Arts in Teaching (M.A.T.) in Foreign Language Education

○ American Sign Language	○ Hebrew
○ Arabic	○ Hindi
○ Cherokee	○ Italian
○ Chinese	○ Korean
○ French	○ Latin
○ German	○ Portuguese
○ Japanese	○ Russian
○ Greek (Ancient)	○ Spanish
○ Greek (Modern)	○ Swahili
	○ Turkish

• Graduate Certificate in Teaching in Foreign Language Education

○ American Sign Language	○ Hebrew
○ Arabic	○ Hindi
○ Cherokee	○ Italian
○ Chinese	○ Korean
○ French	○ Latin
○ German	○ Portuguese
○ Japanese	○ Russian
○ Greek (Ancient)	○ Spanish
○ Greek (Modern)	○ Swahili
	○ Turkish

Department of Middle, Secondary, and K-12 Education

mdsk.charlotte.edu

M.A.T. in Foreign Language Education

The Master of Arts in Teaching (M.A.T.) in Foreign Language Education program is a 31-32 credit hour program composed of two phases: the Graduate Certificate in Teaching phase (Phase I) and the Master's degree completion phase (Phase II). Completion of Phase I of the M.A.T. leads to the initial Standard Professional I teaching license. Phase I requires 16-17 credit hours of coursework, including the graduate student teaching/internship experience. Upon completion of Phase I, qualified candidates may apply to continue into Phase II to complete the remaining requirements for the Master's degree and qualify for the advanced Standard Professional II teaching license.

All courses for both phases of the M.A.T. must be completed within seven years. Coursework within Phase

I/Graduate Certificate must be completed within five years.

This Graduate Certificate program is offered 100% online through the Office of Distance Education. For more information, visit distanceed.charlotte.edu.

Admission Requirements

Admission Requirements for the Graduate School

Please refer to admission information in the Admission to the Graduate School section of this Catalog.

Admission Requirements for all M.A.T. Programs

- Completion of the Graduate Certificate in Teaching
- A minimum graduate GPA of 3.5 in the Graduate Certificate in Teaching*
- One recommendation from a full-time faculty member who has taught you in the Graduate Certificate in Teaching program
- A statement of purpose

The admission process includes the Application for Graduation from the Graduate Certificate program. Interested applicants may apply online at the Graduate Admissions website.

**Students with a GPA below 3.5 in the Graduate Certificate phase may be considered for admission to the M.A.T. program with scores above the 30th percentile on either the GRE or Miller Analogies Test.*

Admission Requirements for Foreign Language Education

Candidates with an undergraduate degree a college or university accredited by an accepted accrediting body and a cumulative undergraduate GPA of 2.7 have 3 options to gain admission to the Graduate Certificate in Foreign Language Education program:

- **Option 1:** Candidates who have a bachelor's degree with a major in the intended language of instruction
- **Option 2:** Demonstrate native or near-native speaker proficiency in the intended language of instruction via a passing score on the Praxis Subject Assessment or a minimum score of Advanced Low on the ACTFL Oral Proficiency Interview (OPI) AND Writing Proficiency test (WPT) in the intended language of instruction
- **Option 3:** Candidates who have the equivalent of a major in the intended language of instruction via completion of a minimum of 24 credit hours of post-secondary coursework in the intended language of instruction. At least two of these courses must be at the 4000 (advanced) level and all must be conducted in the foreign language in which they are seeking licensure. Candidates choosing to pursue this admission route must contact the Office of Teacher Education Advising and Licensure (TEAL) for advising.

Candidates pursuing a license in one of the following languages are eligible for admission to the Graduate Certificate in Foreign Language Education. Due to limited availability of internship sites, candidates seeking licensure in the less commonly taught languages (indicated with an asterisk below) must be residency teachers and complete the internship in their own classroom.

• American Sign Language (K-12)*	• Hebrew (K-12)*
• Arabic (K-12)	• Hindi (K-12)*
• Cherokee (K-12)*	• Italian (K-12)*
• Chinese (K-12)	• Korean (K-12)*
• French (K-12)	• Latin (K-12)*
• German (K-12)	• Portuguese (K-12)*
• Japanese (K-12)	• Russian (K-12)*
• Greek (Ancient) (K-12)*	• Spanish (K-12)
• Greek (Modern) (K-12)*	• Swahili (K-12)*
	• Turkish (K-12)*

Prior to admission into the final semester of student teaching, candidates must demonstrate proficiency in the foreign language via reaching a benchmark score on the Oral Proficiency Interview.

Degree Requirements

Phase I: Graduate Certificate in Teaching (16-17 credit hours)

Methods I Block Courses (3 credit hours)

MDSK 6162 - Planning for K-12 Instruction (3)

Equity and Education Course (2 credit hours)

MDSK 5204 - The Connected Classroom (2)

Methods II Block Courses (4 credit hours)

FLED 5105 - Applied Content Pedagogy (1)

FLED 5200 - Methods in Teaching Foreign Languages (3)

Assessment Course (2 credit hours)

FLED 5104 - Assessment in the Teaching of K-12 Foreign Languages (2)

Customized Course (2-3 credit hours)

In consult with advisor, select one of the following:

MDLG 5130 - The Middle Grades Experience (2)

SECD 5140 - The Secondary School Experience (2)

Advanced Content Course (5000-6999) in the intended licensure area (3) (*French, German, or Spanish only*)

Internship/Student Teaching (3 credit hours)

The graduate-level student teaching/internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. Students are assigned to an appropriate

classroom with a licensed K-12 teacher (in the intended licensure area) for a full-time, semester-long experience under the supervision of the classroom teacher and University faculty. Residency teachers must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship experience and licensure requirements. Prior to student teaching, foreign language education teacher candidates must demonstrate advanced language skills by obtaining a minimum score of Advanced Low on the related Oral Proficiency Interview (OPI) in the language of intended licensure. There is no required internship for Phase II of the M.A.T. program.

FLED 6470 - Graduate Student Teaching and Internship - Foreign Language Education (3 to 6)

Phase II: Completion of the M.A.T. (15 credit hours)

Specialized Pedagogy Course (3 credit hours)

Select one of the following:

MDSK 6220 - Adolescence and Learning (2 or 3)

TESL 6206 - Globalization, Communities, and Schools (3)

Methods Courses (6 credit hours)

RSCH 6101 - Research Methods (3)

FLED 6200 - Advanced Methods of Teaching Foreign Languages (3)

Leadership Course (3 credit hours)

MDSK 6260 - Teacher Leadership (3)

Capstone Course (3 credit hours)

Candidates complete the Comprehensive Electronic Portfolio project within the Capstone Course. In addition, candidates for the M.A.T. complete an electronic licensure portfolio during coursework that demonstrates their readiness for the advanced Standard Professional II teaching license.

MDSK 6691 - Seminar in Professional Development (3)

Degree Total = 31-32 Credit Hours

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisors at least once each semester.

Clinical Field Experiences

Most courses require students to develop their knowledge, skills, and dispositions in public school settings. These experiences broaden their ability to help all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences,

students apply theories and understandings gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. *All students are expected to complete clinical experiences in at least two significantly different settings.* Residency teacher candidates are permitted to complete clinical hours in their own school sites.

Alternative settings must be approved by the instructor and may include schools on different schedules, after-school and summer programs, Saturday programs, private, and charter schools.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, students will be recommended for the North Carolina initial Standard Professional I teaching license. For this initial license, students are required to complete an electronic licensure portfolio that is created during coursework and student teaching. Upon successful completion of Phase II, students will be recommended for the North Carolina advanced Standard Professional II teaching license. For the advanced license, students are required to complete an advanced electronic licensure portfolio during coursework.

Graduate Certificate in Teaching: Foreign Language Education

The Graduate Certificate in Foreign Language Education consists of 16-17 credit hours and is a distance education program which combines web-based and off-campus courses; candidates must be geographically located in the State of North Carolina. The certificate is designed for individuals with a bachelor's degree. Upon completion of the graduate certificate, candidates are eligible for the North Carolina Initial Standard Professional I (SPI) teaching license.

The 16-17 credit-hours earned from the Graduate Certificate may also be applied toward the Master of Arts in Teaching Foreign Language Education upon acceptance to the Master's program. Completion of the Master's degree leads to the advanced "M" teaching license.

All courses for the Graduate Certificate must be completed within five years.

Admission Requirements

Admission Requirements for the Graduate School

Please refer to admission information in the Graduate School section of this Catalog.

Admission Requirements for all Graduate Certificates in Teaching Programs

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.7 *(For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL))*
- 3) Two professional references in a supervisory capacity (i.e. principal or manager) and/or academic references (i.e. professor)
- 4) Statement of purpose
- 5) Clear criminal background check
- 6) Apply online at gradadmissions.charlotte.edu

Admission Requirements for Foreign Language Education

Candidates with an undergraduate degree from a college or university accredited by an accepted accrediting body and a cumulative undergraduate GPA of 2.7 have 3 options to gain admission to the Graduate Certificate in Foreign Language Education program:

- **Option 1:** Candidates who have a bachelor's degree with a major in the intended language of instruction
- **Option 2:** Demonstrate native or near-native speaker proficiency in the intended language of instruction via a passing score on the Praxis Subject Assessment or a minimum score of Advanced Low on the ACTFL Oral Proficiency Interview (OPI) AND Writing Proficiency test (WPT) in the intended language of instruction
- **Option 3:** Candidates who have the equivalent of a major in the intended language of instruction via completion of a minimum of 24 credit hours of post-secondary coursework in the intended language of instruction. At least two of these courses must be at the 4000 (advanced) level and all must be conducted in the foreign language in which they are seeking licensure. Candidates choosing to pursue this admission route must contact the Office of Teacher Education Advising and Licensure (TEAL) for advising.

Candidates pursuing a license in one of the following languages are eligible for admission to the Graduate Certificate in Foreign Language Education. *Due to limited availability of internship sites, candidates seeking licensure in the less commonly taught languages (indicated with an asterisk * below) must be residency teachers and complete the internship in their own classroom.*

- American Sign Language (K-12)*
- Arabic (K-12)
- Cherokee (K-12)*
- Chinese (K-12)
- French (K-12)
- German (K-12)
- Japanese (K-12)

- Greek (Ancient) (K-12)*
- Greek (Modern) (K-12)*
- Hebrew (K-12)*
- Hindi (K-12)*
- Italian (K-12)*
- Korean (K-12)*
- Latin (K-12)*
- Portuguese (K-12)*
- Russian (K-12)*
- Spanish (K-12)
- Swahili (K-12)*
- Turkish (K-12)*

Prior to admission into the final semester of student teaching, candidates must demonstrate proficiency in the foreign language via reaching a benchmark score on the Oral Proficiency Interview.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Certificate Requirements

Methods I Block Courses (3 credit hours)

MDSK 6162 - Planning for K-12 Instruction (3)

Equity and Education Course (2 credit hours)

MDSK 5204 - The Connected Classroom (2)
or EDUC 5100 - 21st Century Learners (3)
or TESL 6204 - Multicultural Education (3)

Methods II Block Courses (4 credit hours)

FLED 5105 - Applied Content Pedagogy (1)
FLED 5200 - Methods in Teaching Foreign Languages (3)

Assessment Course (2 credit hours)

FLED 5104 - Assessment in the Teaching of K-12 Foreign Languages (2)

Customized Course (2-3 credit hours)

In consult with advisor, select one of the following:

MDLG 5130 - The Middle Grades Experience (2)
SECD 5140 - The Secondary School Experience (2)
Advanced Content Course (5000-6999) in the intended licensure area (3)
or MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)

Internship/Student Teaching (3 credit hours)

The graduate-level student teaching/internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. Students are assigned to an appropriate classroom with a licensed K-12 teacher (in the intended licensure area) for a full-time, semester-long experience under the supervision of the classroom teacher and University faculty. Residency teachers must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship experience and licensure requirements. Prior to student teaching, foreign language education teacher candidates must demonstrate advanced language skills by obtaining a minimum score of Advanced Low on the related Oral Proficiency Interview (OPI) in the language of intended licensure.

FLED 6470 - Graduate Student Teaching and Internship - Foreign Language Education (3 to 6)

Certificate Total = 16-17 Credit Hours

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisors at least once each semester.

Clinical Field Experiences

Most courses require students to develop their knowledge, skills, and dispositions in public school settings. These experiences broaden their ability to help all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, students apply theories and understandings gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. *All students are expected to complete clinical experiences in at least two significantly different settings.* Residency teacher candidates are permitted to complete clinical hours in their own school sites.

Alternative settings must be approved by the instructor and may include schools on different schedules, after-school and summer programs, Saturday programs, private, and charter schools.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, students will be recommended for the North Carolina initial Standard Professional I teaching license. For this license, students are required to complete an electronic licensure portfolio that is created during coursework and student teaching.

LEARNING, DESIGN, AND TECHNOLOGY

- **M.Ed. in Learning, Design, and Technology**
 - School Specialist
 - Training and Development
 - Online Learning and Teaching
- **Graduate Certificate in Learning, Design, and Technology**
 - School Specialist
 - Training and Development
 - Online Learning and Teaching

Department of Educational Leadership
edld.charlotte.edu

M.Ed. in Learning, Design, and Technology

The M.Ed. in Learning, Design, and Technology is a 30-credit hour degree program for those pursuing learning, design and technology credentials as preparation for leadership and curriculum design in the corporate, higher education, or government fields; and, for those pursuing these credentials to satisfy requirements for the North Carolina Department of Public Instruction Instructional Technology Specialists: Computers.

Admission Requirements

Applications are accepted for Fall, Spring, and Summer admissions. Check the program website for application deadlines.

The admission process is competitive and determined by the following application components:

- 1) Applicants are required to have a minimum of a B.A. or B.S. degree from a college or university accredited by an accepted accrediting body and a minimum undergraduate GPA of 3.0
- 2) Official transcripts
- 3) Three letters of recommendation from professionals who can judge the quality of the applicant as a future student in this program
- 4) Statement of Purpose of no more than 750 words in 12-point font and double-spaced, written definitively, coherently, and incorporating thoughtful expression in response to:
 - a. What skills and knowledge do you hope to acquire and develop from this program?

- b. Characterize what you would contribute to the collective learning experiences of your fellow students.
- 5) GRE or GMAT scores (*optional*)
- 6) A work sample that is appropriate for the degree such as an instructional video, portfolio, tutorial, research paper, or technology-enhanced lesson plan (*optional*)
- 7) Additional items required for those interested in the School Specialist concentration to satisfy the North Carolina Department of Public Instruction (NCDPI) Instructional Technology Specialists: Computers (10877). This requirement is only for those who wish to earn the 077 license. Those who wish to work in other instructional technology settings (higher education, corporate, military, government) do not have to fulfill this requirement.
 - a. A valid appropriate North Carolina teaching license A or G level (or equivalent from another state). In the online admission application, there is a field in which to specify the type of teaching license. Rather than uploading a copy of the teaching license into the application system, scan the license and email a copy to the Program Director
 - b. A minimum of 2 to 3 years teaching experience

Degree Requirements

The M.Ed. in Learning, Design, and Technology program requires a total of 33 credit hours comprising courses in a selected concentration, an internship, and capstone project.

Concentration Requirements

Below are the suggested courses for each concentration. Students should work with an advisor to determine the related coursework that works best in their program of study. For the most current approved courses, visit the Learning, Design, and Technology website at edld.charlotte.edu/programs/instructional-systems-technology-program.

School Specialist Concentration

This concentration is for those who work in the P-12 system and who already hold either an "A" or "G" level teaching license from the North Carolina Department of Public Instruction (or from another state) for the new Masters/Advanced "M" license in Instructional Technology Specialists.

Required Courses (21 credit hours)

- ELDT 5100 - Technology Integration in Education (3)
- ELDT 6100 - Foundations of Learning, Design, and Technology (3)
- ELDT 6110 - Instructional Design (3)
- ELDT 6130 - Instructional Multimedia Development (3)

- ELDT 6135 - Learning Media, Resources, and Technology (3)
- RSCH 6101 - Research Methods (3)
- ELDT 6140 - Instructional Video Development (3)
or ELDT 6145 - Visual Design of Instructional Products (3)

Elective Courses (3 credit hours)

Select one of the following:

- ELDT 6000 - Topics in Learning, Design, and Technology (1 to 6)
- ELDT 6101 - Learning Principles in Learning, Design, and Technology (3)
- ELDT 6120 - Current Trends in Learning, Design, and Technology (3)
- ELDT 6121 - Advanced Instructional Design (3)
- ELDT 6140 - Instructional Video Development (3)
- ELDT 6145 - Visual Design of Instructional Products (3)
- ELDT 6150 - Design, Development, and Evaluation of Online Learning Systems (3)
- ELDT 6160 - Designing Learning Systems with Simulation and Game Technology (3)
- ELDT 6170 - Human Performance Technology (3)
- ELDT 6180 - LDT Project Management and Team Leadership (3)
- RSCH 7196 - Program Evaluation Methods (3)

Training and Development Concentration

This concentration is for instructional technology personnel who wish to do training and development in corporate, higher education, government, and military.

Required Courses (21 credit hours)

- ELDT 6100 - Foundations of Learning, Design, and Technology (3)
- ELDT 6110 - Instructional Design (3)
- ELDT 6121 - Advanced Instructional Design (3)
- ELDT 6130 - Instructional Multimedia Development (3)
- ELDT 6140 - Instructional Video Development (3)
or ELDT 6180 - LDT Project Management and Team Leadership (3)
- ELDT 6170 - Human Performance Technology (3)
- RSCH 6101 - Research Methods (3)

Elective Courses (3 credit hours)

Select one of the following:

- ELDT 5100 - Technology Integration in Education (3)
- ELDT 6000 - Topics in Learning, Design, and Technology (1 to 6)
- ELDT 6101 - Learning Principles in Learning, Design, and Technology (3)
- ELDT 6120 - Current Trends in Learning, Design, and Technology (3)
- ELDT 6135 - Learning Media, Resources, and Technology (3)
- ELDT 6140 - Instructional Video Development (3)
- ELDT 6145 - Visual Design of Instructional Products (3)

ELDT 6150 - Design, Development, and Evaluation of Online Learning Systems (3)
 ELDT 6160 - Designing Learning Systems with Simulation and Game Technology (3)
 RSCH 7196 - Program Evaluation Methods (3)

Online Learning and Teaching Concentration

This concentration is for those interested in designing, developing, or managing online learning and teaching.

Required Courses (21 credit hours)

ELDT 6100 - Foundations of Learning, Design, and Technology (3)
 ELDT 6101 - Learning Principles in Learning, Design, and Technology (3)
 ELDT 6110 - Instructional Design (3)
 ELDT 6130 - Instructional Multimedia Development (3)
 ELDT 6140 - Instructional Video Development (3)
 or ELDT 6160 - Designing Learning Systems with Simulation and Game Technology (3)
 ELDT 6150 - Design, Development, and Evaluation of Online Learning Systems (3)
 RSCH 6101 - Research Methods (3)

Elective Courses (3 credit hours)

Select one of the following:

ELDT 5100 - Technology Integration in Education (3)
 ELDT 6000 - Topics in Learning, Design, and Technology (1 to 6)
 ELDT 6120 - Current Trends in Learning, Design, and Technology (3)
 ELDT 6121 - Advanced Instructional Design (3)
 ELDT 6135 - Learning Media, Resources, and Technology (3)
 ELDT 6140 - Instructional Video Development (3)
 ELDT 6160 - Designing Learning Systems with Simulation and Game Technology (3)
 ELDT 6170 - Human Performance Technology (3)
 ELDT 6180 - LDT Project Management and Team Leadership (3)
 RSCH 7196 - Program Evaluation Methods (3)

Internship and LDT Capstone Project (6 credit hours)

Students in each concentration must complete an Internship and a Capstone Project as part of the Capstone experience. The internship requires 100 working hours with a client on an LDT-related project. *(Note: Students working in LDT related positions may apply to waive the internship in favor of taking an additional elective.)*

The Capstone is the culminating experience of the program and requires the completion of an entire LDT project for a client and presenting it to a committee of LDT faculty. For more specific information regarding the Master's Capstone Project, students should contact their advisor.

ELDT 6491 - Internship in Learning, Design, and Technology (3)

ELDT 6492 - Capstone Project in Learning, Design, and Technology (3)

Degree Total = 30 Credit Hours

Licensure – Instructional Technology Specialist (North Carolina 077)

The M.Ed. Program in Learning, Design, and Technology with a School Specialist concentration also qualifies graduates who already hold either an "A" or "G" level teaching license from the North Carolina Department of Public Instruction (or from another state) for the new Masters/Advanced "M" license in Instructional Technology Specialists: Computers (NC 077) license. Students should work with an advisor to complete these requirements. Students in the other concentrations earn the M.Ed. degree, but not the 077 license.

Graduate Certificate in Learning, Design, and Technology

This graduate certificate program prepares learning, design and technology professionals to create, analyze, use, integrate, implement, assess, evaluate and manage instructional and performance solutions. When students graduate, they hold learning, design and technology positions in education (P-12 and higher education), corporate, government, or military organizations. The program develops professionals who are solidly grounded in learning technology foundations, principles, theories, applications, and current trends and provides opportunities for them to integrate different forms of technology to enhance teaching and learning. Students select from one of three concentrations:

- 1) School Specialist (18 credit hours)
- 2) Training and Development (15 credit hours)
- 3) Online Learning and Teaching (15 credit hours)

This graduate certificate program is offered 100% online.

Program Objectives

Aligned with the Association for Educational Communications and Technology (AECT), International Society for Technology in Education (ISTE), and North Carolina Department of Public Instruction (NCDPI) standards, this program prepares graduates to:

- Create, use, assess, and manage theoretical and practical applications of educational technologies and processes.
- Demonstrate effective analysis, integration, and implementation of educational technologies and

processes based on contemporary content and pedagogy.

- Facilitate learning by creating, using, evaluating, and managing effective learning environments.
- Design, develop, implement, and evaluate technology-rich learning environments within a supportive community of practice.
- Explore, evaluate, synthesize, and apply methods of inquiry to enhance learning and improve performance.

Admission Requirements

Applications are accepted for Fall, Spring, and Summer admissions. Check the program website for application deadlines.

- B.A. or B.S. degree in an appropriate field of study from a college or university accredited by an accepted accrediting body
- Official transcripts
- An undergraduate GPA of 2.75 or higher for the last two years of coursework
- Evidence of strong written and oral communication skills
- For those seeking the 079 endorsement, the following additional documents are required:
 - A valid North Carolina teacher's license
 - A minimum of 2 to 3 years teaching or other professional experience
- Statement of Purpose of no more than 750 words in 12-point font and double-spaced, written definitively, coherently, and incorporating thoughtful expression in response to:
 - How will this program help you to achieve your professional goals?
 - What skills and knowledge do you hope to acquire and develop from this program?
 - Characterize what you would contribute to the collective learning experiences of your fellow students.
 - Develop your narrative to respond clearly to the prompts and give the reader definitive, coherent, and thoughtful expression.

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate certificate (Online Learning and Teaching concentration only) degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements.

Certificate Requirements

Select one of the following concentrations:

School Specialist Concentration

This concentration is for those who work in the P-12 system and who already hold either an "A" or "G" level teaching license from the North Carolina Department of Public Instruction (or from another state). School system personnel who currently hold a valid "A" or "M" level teaching license and are eligible for the Special Endorsement in Computer Education (079 License) by the North Carolina Department of Public Instruction at the end of this graduate certificate.

Required Courses (18 credit hours)

ELDT 5100 - Technology Integration in Education (3)
 ELDT 6100 - Foundations of Learning, Design, and Technology (3)
 ELDT 6110 - Instructional Design (3)
 ELDT 6130 - Instructional Multimedia Development (3)
 ELDT 6135 - Learning, Media, Resources, and Technology (3)
 ELDT 6140 - Instructional Video Development (3)
 or ELDT 6145 - Visual Design of Instructional Products (3)

Training and Development Concentration

This concentration is for those who wish to do training and development in corporate, higher education, government, and military.

Required Courses (15 credit hours)

ELDT 6100 - Foundations of Learning, Design, and Technology (3)
 ELDT 6110 - Instructional Design (3)
 ELDT 6130 - Instructional Multimedia Development (3)
 ELDT 6170 - Human Performance Technology (3)
 ELDT 6140 - Instructional Video Development (3)
 or ELDT 6180 - LDT Project Management and Team Leadership (3)

Online Learning and Teaching Concentration

This concentration is for those interested in designing, developing, or managing online learning and teaching. -

Required Courses (15 credit hours)

ELDT 6100 - Foundations of Learning, Design, and Technology (3)
 or ELDT 8100 - Foundations of Learning, Design, and Technology (3)
 ELDT 6110 - Instructional Design (3)
 or ELDT 8110 - Instructional Design (3)
 ELDT 6130 - Instructional Multimedia Development (3)
 or ELDT 8130 - Instructional Multimedia Development (3)
 ELDT 6140 - Instructional Video Development (3)
 or ELDT 8140 - Instructional Video Development (3)
 ELDT 6150 - Design, Development, and Evaluation of Online Learning Systems (3)

or ELDT 8150 - Design, Development, and Evaluation of Online Learning Systems (3)

ELDT 6180 - LDT Project Management and Team Leadership (3)

or ELDT 8180 - LDT Project Management and Team Leadership (3)

Certificate Total = 15-18 Credit Hours

Licensure (079 Endorsement)

School system personnel who currently hold a valid "A" or "M" level teaching license and who complete the School Specialist concentration of the Graduate Certificate in Learning, Design, and Technology are eligible to earn the Special Endorsement in Computer Education (079) by the North Carolina Department of Public Instruction.

Professionals in the other concentrations will receive the Graduate Certificate only and not the 079 endorsement.

READING EDUCATION

- **M.Ed. in Reading Education**
- **Graduate Certificate in Advanced Literacy Instruction and Intervention**

Department of Reading and Elementary Education

reel.charlotte.edu

M.Ed. in Reading Education

Designed for experienced teachers, the M.Ed. in Reading Education program qualifies graduates for the North Carolina Advanced Standard Professional II teaching license in K-12 reading education. Relevant to all areas of the K-12 curriculum, this program is designed for classroom teachers and aspiring literacy specialists who are interested in improving instructional programs and practices that promote literacy among all learners.

Based on professional standards published by the International Reading Association and the N.C. State Department of Education, the program prepares graduates who: 1) understand the theoretical and evidence-based foundations of literacy, including reading and writing processes and instruction; 2) use instructional approaches, materials and an integrated, comprehensive, balanced curriculum to support student learning in reading and writing; 3) use a variety of assessment tools and practices to plan and evaluate effective reading and literacy instruction; 4) create and engage their students in literacy practices that develop awareness, understanding, respect, and a valuing of differences and diversity in our society; and 5) demonstrate, and facilitate professional learning and leadership as a career-long effort and responsibility by serving as a resource to educate teachers, administrators, and the community.

The M.Ed. in Reading Education program is offered fully online. The program is designed as a cohort model. Students can complete the degree within two years/five semesters (Fall, Spring, Summer, Fall, Spring).

Admission Requirements

The M.Ed. in Reading Education does not have admissions testing requirements (e.g., the MAT or GRE). Applicants may elect to submit a GRE or MAT test score as part of their application but are not required for consideration for admission to the program.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The M.Ed. in Reading Education program requires a total of 33 credit hours of courses in three phases:

Phase I: Foundations of Literacy and Leadership (6 credit hours)

READ 6100 - Trends and Issues in Literacy and Leadership (3)

READ 6300 - Global Literacy: Genre Study (3)

Phase II: Developmentally Appropriate Assessment and Instruction (21 credit hours)

EDUC 6254 - Individualizing Instruction for All Learners (3)

ELED 6303 - Teacher Inquiry and Data Analysis in the Classroom (3)

READ 6204 - Teaching Reading to English Language Learners (3)

READ 6252 - K-12 Writing Development and Instruction (3)

READ 6255 - Middle/Secondary Reading and Writing (3)

READ 6300 - Global Literacy: Genre Study (3)

RSCH 6101 - Research Methods (3)

Phase III: Advanced Literacy Intervention and Leadership (6 credit hours)

READ 6254 - Collaborative Leadership in Literacy Education (3)

READ 6260 - Diagnostic Assessment and Instruction in Reading (3)

Degree Total = 33 Credit Hours**Clinical Field Experiences**

Students in the M.Ed. in Reading Education program participate in field experiences that require them to apply coursework in classroom settings, analyze K-12 student learning, and reflect on their practice in the context of theories on teaching and learning. Students deepen their understanding of the knowledge, skills, and professional dispositions that foster student learning. These experiences broaden their ability to help all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. These field experiences are embedded in course assignments and are often conducted in a student's classroom if they are currently teaching. These field experiences also can take place in multiple settings such

as neighboring schools or districts, day care centers and afterschool programs, or youth centers.

Assistantships

The Department typically has a limited number of Graduate Assistantships, pending resources. Applications are available from the Department of Reading and Elementary Education.

Graduate Certificate in Advanced Literacy Instruction and Intervention

The Graduate Certificate in Advanced Literacy Instruction and Intervention provides K-12 teachers with skills in using data and current research on literacy to design and implement classroom literacy instruction and interventions. This is a 12 credit hour certificate program that focuses on helping teachers enhance literacy outcomes for diverse learners.

Admission Requirements

- Bachelor's degree, or its equivalent, from a college or university accredited by an accepted accredited body
- Minimum GPA of 3.00 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school)
- Online application through the Graduate School's application system
- Statement of purpose
- Unofficial transcripts of all college course work attempted
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Certificate Requirements

Students must complete 12 hours of coursework: two required courses and two that they select.

Required Courses (6 credit hours)

READ 6252 - K-12 Writing Development and Instruction (3)

READ 6260 - Diagnostic Assessment and Instruction in Reading (3)

Elective Courses (6 credit hours)

Select two of the following courses (6 credit hours):

READ 6100 - Trends and Issues in Literacy and

Leadership (3)

READ 6204 - Teaching Reading to English Language

Learners (3)

READ 6250 - Emergent and Elementary Literacy (3)

READ 6255 - Middle/Secondary Reading and Writing (3)

READ 6300 - Global Literacy: Genre Study (3)

Certificate Total = 12 Credit Hours

Grade Requirements

Students must maintain satisfactory grades and must maintain satisfactory progress toward the certificate. Students are expected to achieve a commendable or satisfactory grade (A or B) in all coursework attempted for graduate credit. An accumulation of three marginal C grades in any graduate coursework will result in suspension of the student's enrollment.

SPECIAL EDUCATION

- **Ph.D. in Special Education**
- **M.Ed. in Special Education and Child Development**
 - Academically or Intellectually Gifted (AIG)
 - Applied Behavior Analysis
 - Child and Family Studies
 - Special Education
- **M.A.T. in Special Education**
 - General Curriculum
 - Adapted Curriculum
- **Graduate Certificate in Academically or Intellectually Gifted (AIG)**
- **Graduate Certificate in Applied Behavior Analysis**
- **Graduate Certificate in Autism Spectrum Disorder (ASD)**
- **Graduate Certificate in Special Education**
 - General Curriculum
 - Adapted Curriculum

Department of Special Education and Child Development

spcd.charlotte.edu

Ph.D. in Special Education

The doctoral program at UNC Charlotte prepares special educators as collaborators, teachers, leaders, and researchers whose work contributes to enhancing the quality of life of individuals who are exceptional learners and their families. Students specialize in high or low incidence disabilities or in the Academically or Intellectually Gifted (AIG). This program offers graduates the widest array of career options and provides the solid research foundation needed for the rapidly changing field of special education. Potential employment for program graduates includes faculty positions in higher education as teacher trainers/researchers and leadership positions in schools and agencies.

The program builds on the Master of Education in Special Education or a comparable program. Applicants who wish to focus on AIG may have a Master's degree in other areas of education with additional coursework in gifted education. The 65-credit Ph.D. program includes 18 credit hours in doctoral seminars in special education, 15 credit

hours in research and practice (field work and writing courses), 20 credit hours in research, 9 credit hours of an individually designed specialty, and a dissertation with enrollment in at least 3 dissertation credits. Additional coursework may be required for students who do not have a Master's degree or licensure in Special Education or AIG; whose master's program was not comparable to UNC Charlotte's; or whose Master's coursework is outdated.

The program will accept up to two courses as transfer from a doctoral-granting college or university accredited by an accepted accrediting body, providing the Special Education Doctoral Committee determines that the course or courses to be transferred are equivalent to similar courses required in the UNC Charlotte Special Education Ph.D. program or fit the specialty area. The grade in these transfer courses must be an A or B. Transfer credits cannot replace the five core doctoral seminars in special education, and all of the dissertation work must be completed at UNC Charlotte.

Students are admitted for either full-time study or intensive part-time study and begin in the Fall semester. Students must complete their degree, including the dissertation, within nine years. The minimum time for completion for a full-time student is 3 years. Full-time students must meet benchmark requirements each year to maintain their status as a doctoral student. Part-time students also must meet benchmark requirements that occur approximately every two years. These benchmarks are intended to help students achieve their goal of completing the doctorate in a timely manner.

Admission Requirements

Applications for admission will be accepted once a year to begin doctoral studies in the fall semester and must be submitted to the Graduate Admissions Office by December 1.

The following documents must be submitted in support of the application:

- 1) One official transcript of all academic work attempted since high school indicating a GPA of 3.5 (on a scale of 4.0) in a graduate degree program.*
- 2) At least three references* of someone who knows the applicant's current work and/or academic achievements in previous degree work.
- 3) A two page essay describing prior experiences with individuals with exceptionalities and objectives for pursuing doctoral studies.*
- 4) A current resume or vita.
- 5) A professional writing sample (e.g., published article, manuscript submitted for publication, term paper submitted in prior coursework, abstract of thesis, teaching manual).
- 6) Documentation of teaching and other field experience (e.g., copy of teaching evaluation or letter of recommendation from supervisor and licensure in special education or AIG certificate)
- 7) An interview with the program faculty.
- 8) International students must submit official and acceptable English language proficiency test scores on the Test of English as a Foreign Language (TOEFL), the Michigan English Language Assessment Battery (MELAB), or the International English Language Testing System (IELTS). All tests must have been taken within the past two years.**
- 9) Applicants may be requested to submit a new writing sample in response to a prompt upon submitting their application, and before interviews are offered.

**These items are required of applicants to any of UNC Charlotte's doctoral programs.*

***See the Graduate School's website for minimum acceptable scores.*

Degree Requirements

Doctoral Seminars in Special Education (18 credit hours)

Note: Students with a focus on AIG may substitute SPED 8675 with a course approved by the doctoral program director.

SPED 8671 - Doctoral Seminar in Special Education Research (3)

SPED 8672 - Doctoral Seminar in Leadership in Special Education (3)

SPED 8673 - Doctoral Seminar in Collaboration (3)

SPED 8674 - Doctoral Seminar in Teaching in Special Education (3)

SPED 8675 - Special Education Doctoral Seminar in Applied Behavioral Analysis (3)

SPED 8699 - Dissertation Proposal Seminar in Special Education (3)

Research and Practice in Special Education (12 credit hours)

Note: The following courses are used in the development of portfolios I and II.

SPED 8272 - Research Implementation in Special Education (3)

SPED 8273 - Grant Writing in Special Education (3)

SPED 8277 - Professional Writing in Special Education (3)

SPED 8475 - University Co-Teaching in Special Education and Child Development: Level I (3)

SPED 8478 - University Co-Teaching in Special Education and Child Development: Level II (3)

Research Courses (20 credit hours + Doctoral Seminar in Research and Dissertation Seminar)

RSCH 8110 - Descriptive and Inferential Statistics (3)

RSCH 8111 - Qualitative Research Methods (3)

RSCH 8113 - Single-Case Research (3)

RSCH 8120 - Advanced Statistics (3)

SPED 8920 - Leadership in Special Education Research (1) (*repeated once for credit*)

Plus two of the following:

RSCH 8112 - Survey Research Methods (3)
 RSCH 8121 - Qualitative Data Collection and Analysis (3)
 RSCH 8131 - Interviewing as Qualitative Inquiry (3)
 RSCH 8140 - Multivariate Statistics (3)
 RSCH 8150 - Structural Equation Modeling (3)
 RSCH 8160 - Hierarchical Linear Models in Education (3)
 RSCH 8196 - Program Evaluation Methods (3)
 RSCH 8197 - Design and Analysis of Experimental and Quasi-Experimental Evaluations (3)
 RSCH 8220 - Educational and Psychological Measurement (3)
 RSCH 8230 - Theory and Applications of Measurement (3)
 RSCH 8890 - Special Topics in Research (3)
 SPED 8800 - Independent Study in Special Education (1 to 6)

Advanced Specialty Track Courses (9 credit hours)

Doctoral students select Advanced Specialty Tracks in Research or University Teaching. This specialty is designed to support specialized knowledge in the selected area, and may include the following components:

Required Courses for Advanced Specialty in Teaching (6 credit hours)

The Advanced Specialty in Teaching requires the following coursework, plus one 3-credit hour elective.

SPED 8474 - Supervision of Student Teachers in Special Education (3)
 SPED 8479 - University Co-Teaching in Special Education and Child Development: Level III (3)

Specialty Track Teaching Elective Courses (3 credit hours)

One 3-credit hour elective course is required from the following list, or other teaching specialty electives upon approval of the doctoral program director:

ADMN 8171 - The American College Student (3)
 ADMN 8695 - Advanced Seminar in Teaching and Learning (3)
 EDCI 8681 - Seminar in College Teaching (3)
 ELDT 8150 - Design, Development, and Evaluation of Online Learning Systems (3)
 GRAD 8201 - Teaching at the University Level (2 to 3)
 SPED 8479 - University Co-Teaching in Special Education and Child Development: Level III (3)

Advanced Specialty Track in Research Elective Courses (9 credit hours)

The Advanced Specialty in Teaching requires three 3-credit hour electives from the following list of research method courses, or other research specialty electives upon approval of the doctoral program director.

RSCH 8112 - Survey Research Methods (3)
 RSCH 8121 - Qualitative Data Collection and Analysis (3)
 RSCH 8131 - Interviewing as Qualitative Inquiry (3)
 RSCH 8140 - Multivariate Statistics (3)
 RSCH 8150 - Structural Equation Modeling (3)
 RSCH 8160 - Hierarchical Linear Models in Education (3)
 RSCH 8196 - Program Evaluation Methods (3)
 RSCH 8197 - Design and Analysis of Experimental and Quasi-Experimental Evaluations (3)
 RSCH 8220 - Educational and Psychological Measurement (3)
 RSCH 8230 - Theory and Applications of Measurement (3)
 RSCH 8890 - Special Topics in Research (3)
 SPED 8800 - Independent Study in Special Education (1 to 6)

Dissertation (3+ credit hours)

SPED 8999 - Dissertation Credits (3, 6, or 9)

Degree Total = 65 Credit Hours

Additional Degree Requirements

In addition to coursework and the dissertation, students complete a portfolio of achievements related to the four focus areas: leadership, collaboration and diversity, teaching, and research. This portfolio must receive satisfactory ratings from the Portfolio Review Committee at two critical junctures known as Benchmark One and Benchmark Two. The first benchmark serves as a Qualifying Examination and includes demonstration of writing, teaching, and research skills. The second benchmark is comparable to the comprehensive exams required by some Ph.D. programs in Special Education and includes the development of a grant. Students receive opportunities to build this portfolio through the Research and Practice coursework. The following are some of the products in the portfolio: research study introduction, journal article review, conference presentation, advocacy project, grant proposal, team study, and research report.

Dissertation Requirements

The purpose of the dissertation is for doctoral students to demonstrate their ability to synthesize the professional literature and generate new knowledge for the profession through using well-established research tools. For the Ph.D. in Special Education, the dissertation may be quantitative (group or single subject) or qualitative research. Whatever type of design, it must adhere to current standards for quality as reflected in professional writing on the chosen method of research design and reflected in the current literature. Students must be continuously enrolled for dissertation research credits through the semester of graduation. Defense of the dissertation is conducted in a final oral examination that is open to the University community.

Application for Degree

Students must submit an online Application for Degree during the semester in which they successfully defend their dissertation proposal. Adherence to Graduate School deadlines is expected. Degree requirements are completed when students successfully defend their dissertation and file the final copy of the dissertation in the Graduate School.

M.Ed. in Special Education and Child Development

The Master of Education (M.Ed.) in Special Education and Child Development is a professional graduate degree that serves experienced educational professionals who have obtained an undergraduate degree from a college or university accredited by an accepted accredited body and who wish to become collaborative instructional leaders who are knowledgeable, effective, reflective, and responsive to equity and diversity. Upon completion of the 33-credit hour program, graduates who hold an A-Level North Carolina Professional Educator's License may qualify for an M-Level North Carolina Professional Educator's License.

There are four concentrations for the M.Ed. in Special Education and Child Development:

- 1) Academically or Intellectually Gifted
- 2) Applied Behavior Analysis
- 3) Child and Family Studies
- 4) Special Education

For the Concentration in Academically or Intellectually Gifted (AIG), a bachelor's degree and a Standard Professional 1 (SP1) Professional Educator's License in any content area from North Carolina or its equivalent from another state are required. Individuals already employed in a teaching position where licensure is not required, such as a charter or private school, should hold a bachelor's degree in a related field.

Concentration in Academically or Intellectually Gifted

Admission Requirements

- A bachelor's degree from a college or university accredited by an accepted accreditation body and an A-Level Professional Educator's License in any content area from North Carolina or its equivalent from another state (individuals already employed in a teaching position where licensure is not required, such as a charter or private school, should hold a bachelor's degree in a related field from a college or university

accredited by an accepted accreditation body)

- Official transcripts of all previous work beyond high school documenting an overall grade point average of at least 3.0 (based on a 4.0 scale)
- Official agency reports of satisfactory Graduate Record Examination (GRE) or the Miller Analogies Test (MAT) test scores (30th percentile or above)
 - Test Score Requirement Waiver: Applicants who previously have received a grade of A in three (if the fourth course is in progress at the time of application) or all four of the four Graduate Certificate courses in Academically or Intellectually Gifted (AIG) at UNC Charlotte may waive the GRE/MAT score requirement. Note: Waiver requests should be sent to the AIG Graduate Program Director.
 - Students who have received one or more course grades below A in UNC Charlotte graduate certificate courses in AIG, or who are applying directly to the M.Ed., are not eligible for this waiver and must provide GRE or MAT scores with their application.
- At least three evaluations from professional educators familiar with the applicant's personal and professional qualifications
- An essay of no more than two pages, describing the applicant's experience and objective in undertaking graduate study in AIG; goals upon completion of the program should be addressed
- A copy of resume, listing the applicant's professional experience
- Apply online at gradadmissions.charlotte.edu

Degree Requirements

Introductory Research Course (3 credit hours)

RSCH 6101 - Research Methods (3)

Phase I Courses: Developing Perspective (15 credit hours)

SPED 5211 - Nature and Needs of Gifted Students (3)

SPED 6124 - Methods of Instructing Gifted Students (3)

SPED 6161 - Social and Emotional Needs of Gifted Students (3)

SPED 6224 - Adapting Curriculum Materials and Classroom Differentiation (3)

RSCH 7111 - Qualitative Research Methods (3)
or another relevant research course approved by advisor (3)

Phase II Courses: Content and Pedagogy (15 credit hours)

SPED 6241 - Advanced Curriculum for Gifted Students (3)

SPED 6270 - Gifted Assessment and Program Evaluation (3)

SPED 6637 - Theory and Development of Creativity (3)

SPED 6695 - Research Proposal in AIG (3)

SPED 6696 - Research Implementation in AIG (3)

Degree Total = 33 Credit Hours**Concentration in Applied Behavior Analysis****Admission Requirements**

- A bachelor's degree in special education, psychology, social work, or a related field from a college or university accredited by an accepted accrediting body
- Official transcripts of all previous work beyond high school documenting an overall grade point average of at least 3.0 (based on a 4.0 scale)
- Official agency reports of satisfactory Graduate Record Examination (GRE) or the Miller Analogies Test (MAT) test scores (30th percentile or above)
- At least 6 months of documented experience working with individuals with exceptionalities
- At least three evaluations from professional educators familiar with the applicant's personal and professional qualifications
- An essay of no more than two pages describing the applicant's experience and objective in undertaking graduate study in applied behavior analysis
- A copy of resume, listing the applicant's professional experience
- Apply online at gradadmissions.charlotte.edu

Degree Requirements**Introductory Research Course (3 credit hours)**

RSCH 6101 - Research Methods (3)

Introductory Concentration Courses (6 credit hours)

SPED 5200 - Concepts and Principles of Behavior Analysis (3)

SPED 5300 - Lifespan Development for Exceptional Individuals (3)

Core Courses (15 credit hours)

SPED 5201 - Science and Philosophy in Behavior Analysis (3)

SPED 5202 - Supervision and Consultation in Behavior Analytic Programming (3)

SPED 5203 - Ethics, Compliance, and Professionalism in Behavior Analysis (3)

SPED 6225 - Behavior Analytic Intervention in Communication (3)

SPED 6202 - Behavioral Assessment (3)

Research Courses (9 credit hours)

RSCH 7113 - Single-Case Research (3)

SPED 6692 - Research Proposal (2)

SPED 6693 - Research Implementation (2)

SPED 6694 - Research Dissemination and Leadership (2)

Degree Total= 33 Credit Hours**Concentration in Child and Family Studies****Admission Requirements**

- A bachelor's degree in child and family development, elementary education, special education, or a related field from a college or university accredited by an accepted accrediting body
- Official transcripts of all previous work beyond high school documenting an overall grade point average of at least 3.0 (based on a 4.0 scale)
- Official agency reports of satisfactory Graduate Record Examination (GRE) or the Miller Analogies Test (MAT) test scores (30th percentile or above). Students who have concerns about standardized testing (GRE, MAT) should contact the program director.
- Three letters of recommendation from persons familiar with the applicant's personal or professional qualifications; letters should include a combination of professional, academic, and/or personal
- A personal statement outlining why the applicant seeks admission to the program and describing professional experiences with young children and their families; goals upon the completion of the program should be addressed
- A copy of resume, listing the applicant's professional experience
- Apply online at gradadmissions.charlotte.edu

Degree Requirements**Introductory Research Course (3 credit hours)**

RSCH 6101 - Research Methods (3)

Core Courses (15 credit hours)

CHFD 6102 - Learning and Development (3)

CHFD 6115 - Child and Family Advocacy (3)

CHFD 6210 - Inclusive Education for Young Children (3)

CHFD 6220 - Family Theory and Research (3)

CHFD 6240 - Advanced Studies in Infant and Child Development (3)

Applied Research/Evaluation Course (3 credit hours)

CHFD 6900 - Research in Child and Family Studies (Master's Thesis) (3)

Thematic Elective Courses (9 credit hours)

Select elective courses within the EI/ECSE specialty track. Other graduate level courses offered by the Cato College of Education require approval from the advisor.

Early Intervention/Early Childhood Special Education Specialty Track

SPED 6111 - Advanced Issues in Early Intervention/Early Childhood Special Education (EI/ECSE) (3)

SPED 6242 - Enhancing Communication and Supporting Behavior in Early Childhood Settings (3)

SPED 6350 - Young Children with Disabilities and their Families: Interdisciplinary Collaboration (3)

Leadership Seminar Course (3 credit hours)

CHFD 7400 - Applied Leadership in Child and Family Studies (3)

Degree Total = 33 Credit Hours

Concentration in Special Education

Admission Requirements

- A bachelor's degree with a major in special education from a college or university accredited by an accepted accredited body and an A-Level Professional Educator's License in Special Education from the North Carolina Department of Public Instruction (NCDPI) or its equivalent from another state. Applicants with a bachelor's degree in a field other than special education may be considered for admission if there is clear evidence of substantial, successful experience in teaching in special education.
- Official transcripts of all previous work beyond high school documenting an overall grade point average of at least 3.0 (based on a 4.0 scale)
- Official agency reports of satisfactory Graduate Record Examination (GRE) or the Miller Analogies Test (MAT) test scores (30th percentile or above)
- At least three evaluations from professional educators familiar with the applicant's personal and professional qualifications
- An essay of no more than two pages describing the applicant's experience and objective in undertaking graduate study in special education; goals upon the completion of the program should be addressed
- A copy of resume, listing the applicant's professional experience
- Apply online at gradadmissions.charlotte.edu

Degree Requirements

Introductory Research Course (3 credit hours)

RSCH 6101 - Research Methods (3)

Core Courses (9 credit hours)

EDUC 6254 - Individualizing Instruction for All Learners (3)

SPED 6202 - Behavioral Assessment (3)

SPED 5200 - Concepts and Principles of Behavior Analysis (3)

or SPED 5203 - Ethics, Compliance, and Professionalism in Behavior Analysis (3) *(for candidates who selected the Autism Spectrum Disorder Specialty Track as electives)*

Research Courses (9 credit hours)

RSCH 7113 - Single-Case Research (3)

SPED 6692 - Research Proposal (2)

SPED 6693 - Research Implementation (2)

SPED 6694 - Research Dissemination and Leadership (2)

Specialty Track Courses (12 credit hours)

Select elective courses within a single specialty track or other graduate level courses offered by the Cato College of Education approved by the advisor. The credit hours within the Adapted Curriculum and General Curriculum Specialty Tracks enable candidates to add on an additional North Carolina teaching license in Adapted Curriculum or General Curriculum or upgrade an existing license in either area to the master's level.

Adapted Curriculum Specialty Track

SPED 5274 - General Curriculum Access and Adaptations (3)

SPED 5380 - Multiple Disabilities and Systematic Instruction (3)

SPED 6225 - Behavior Analytic Intervention in Communication (3)

SPED 6800 - Individual Study in Special Education (1 to 6)

Autism Spectrum Disorder Specialty Track

SPED 5200 - Concepts and Principles of Behavior Analysis (3)

SPED 6115 - Introduction to Autism Spectrum Disorder (3)

SPED 6225 - Behavior Analytic Intervention in Communication (3)

SPED 6335 - Evidence-Based Practices for Learners with Autism Spectrum Disorder (3)

General Curriculum Specialty Track

SPED 5372 - Planning Mathematics Instruction for Students with Exceptional Needs (3)

SPED 5375 - Foundations of Literacy for Students with Disabilities (3)

SPED 5377 - Advanced Literacy for Students with Disabilities (3)

SPED 6800 - Individual Study in Special Education (1 to 6)

Note: Candidates who are interested in pursuing an Exceptional Children (EC) Program Administrator licensure may take three additional courses (beyond the 33-credit hour M.Ed. program). Completion of these courses plus passing of the required PRAXIS tests in conjunction with earning the master's degree can lead to EC Program Administrator licensure through NCDPI.

ADMN 6100 - Fundamentals of Educational Leadership (3)

ADMN 6120 - Instructional Leadership (3)

ADMN 6130 - Supervision of Instruction (3)

Degree Total = 33 Credit Hours

Advising

Upon acceptance into the program, each candidate is assigned a faculty advisor who helps the candidate

develop his or her program of study and must approve that program of study. Candidates are expected to meet with their advisor each semester to discuss their coursework and progression toward completion of the degree.

Capstone Experience

The capstone experience is fulfilled by completing a Master's Research Project or Master's Thesis. The nature of the project/thesis is developed by the candidate in consultation with the faculty advisor and presented to the committee for approval. The project is usually something that is practical and useful to the candidate in the professional role that will be assumed upon the completion of the degree. For the Academically and Intellectually Gifted, Applied Behavior Analysis, and Special Education concentrations, candidates will complete a Master's Research Project. For the Child and Family Studies concentration, candidates may either complete a Master's Research Project or a Master's Thesis.

Committee

Each candidate will have a committee of at least two graduate faculty members who will provide guidance through their research project or thesis. Candidates should consult with their academic program advisor in the selection of the committee. For the Child and Family Studies concentration, the following guidelines are intended to assist candidates and advisor(s) in constituting the master's thesis committee.

- *Chair* - selected for content knowledge of the subject area that is chosen for the culminating experience. This person should be from the major department. In addition, the chair must hold a graduate faculty appointment in the department.
- *Second and third members* - selected for knowledge and expertise in the subject area or research expertise (can be external to the department).
- *Technical advisor* - an optional committee member selected for technical support (e.g., specialized skills in program evaluation, technical writing, assessment, curriculum design, graphics, ethnography, and survey research methodology). This person may be, but need not be, from the department.
- *Additional members* - may be added if the committee chair agrees. These members may be from departments of the College other than the candidate's department, or may be from other colleges in the University. Additional members may also be from outside the University with the prior written permission of the Dean of the Graduate School. (This whole process should start at the beginning of the semester prior to graduation. However, the candidate may begin any time after completing 18 credit hours.) For candidates in the CHFS concentration, the committee is formed during CHFD 6900.)

Clinical Field Experiences

Most courses require students to apply the knowledge learned in classes to community-based settings and/or public/private school classrooms. For the AIG concentration, this typically involves video of teaching within one's current classroom assignment. For the Applied Behavior Analysis and Special Education concentrations, students are expected to arrange placement(s) to complete their clinical field experiences in the courses. For the Child and Family Studies concentration, clinical hours can be completed in a variety of professional settings (e.g., current position, different class in the same school, community agencies).

Licensure

A-Level licensure is required for an M-Level license. Successful completion of the master's program leads to recommendation for an M-Level North Carolina Professional Educator's License in Academically or Intellectually Gifted, Birth-Kindergarten (B-K), or Special Education (General Curriculum or Adapted Curriculum), as appropriate to the concentration. Graduates in the Child and Family Studies concentration and the Applied Behavior Analysis concentration who do not hold an A-Level license are not eligible for an advanced licensure. However, candidates in the Applied Behavior Analysis concentration who hold an A-Level Professional Educator's License in Special Education may be eligible for an M-Level license if additional coursework is completed.

Research Opportunities/Experiences

Faculty in the Department of Special Education and Child Development continuously achieve regional, state, and national recognition in scholarship, teaching, and research. As a result, candidates may also have the opportunity to become involved in applied research endeavors. Each candidate will complete a research project or a research thesis.

M.A.T. in Special Education

The Master of Arts in Teaching (M.A.T.) program is designed for individuals who do not already hold a bachelor's degree and/or professional teaching license in Special Education. The M.A.T. program is a 35-credit hour program composed of two phases, the Graduate Certificate phase (Phase I) and the Master's degree completion phase (Phase II). Completion of Phase I of the M.A.T. leads to the North Carolina Standard Professional 1 (SP1) Professional Educator's License in Special Education. Phase I requires 21 credit hours of coursework, including the graduate internship experience. Upon completion of Phase I, qualified candidates may apply for Phase II to complete the remaining requirements for the Master's

degree and qualify for the North Carolina Standard Professional 2 (SP2) Professional Educator's License.

All courses for both phases of the M.A.T. must be completed within seven years. Coursework within Phase I/Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to admission information in the "Graduate School" section of this *Catalog*.

Admission Requirements

Graduate Certificate in Teaching (M.A.T. Phase I Initial licensure only)

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 3.0 *(For alternative ways to demonstrate academic competence, applicants may contact the Office of Teacher Education Advising and Licensure (TEAL))*
- 3) Three recommendations from persons knowledgeable of the applicant's interaction with children or youth
- 4) A statement of purpose
- 5) A clear criminal background check
- 6) Apply online at gradadmissions.charlotte.edu

M.A.T. (Phase II) Program

- 1) Completion of the Graduate Certificate in Teaching
- 2) A minimum graduate GPA of 3.5 in the Graduate Certificate in Teaching
- 3) Students with a GPA below 3.5 in the Graduate Certificate may be considered for admission to the M.A.T. program with scores above the 30th percentile on either the GRE or Millers Analogies Test
- 4) One recommendation from a full-time faculty member who has taught the applicant in the Graduate Certificate in Teaching program
- 5) A statement of purpose
- 6) Apply online at gradadmissions.charlotte.edu

Additional Admission Requirements

In addition to the required application materials, candidates must be currently employed as a teacher, teacher assistant, or have taught within the last two years. Candidates must submit proof of employment along with the required application materials.

Degree Requirements

Phase I: Graduate Certificate (21 credit hours)

Concentrations

Select one of the following concentrations and its requirements:

General Curriculum Concentration Courses

(18 credit hours)

- SPED 5173 - Diagnostic Assessment (3)
- SPED 5300 - Lifespan Development for Exceptional Individuals (3)
- SPED 5370 - Multi-tiered Behavioral Supports (3)
- SPED 5372 - Planning Mathematics Instruction for Students with Exceptional Needs (3)
- SPED 5375 - Foundations of Literacy for Students with Disabilities (3)
- SPED 5400 - Practicum: Integrated Instructional Applications in Special Education (3)

Adapted Curriculum Concentration Courses

(18 credit hours)

- SPED 5173 - Diagnostic Assessment (3)
- SPED 5274 - General Curriculum Access and Adaptations (3)
- SPED 5300 - Lifespan Development for Exceptional Individuals (3)
- SPED 5370 - Multi-tiered Behavioral Supports (3)
- SPED 5380 - Multiple Disabilities and Systematic Instruction (3)
- SPED 5400 - Practicum: Integrated Instructional Applications in Special Education (3)

Internship/Student Teaching (3-6 credit hours)

An internship is required for Graduate Certificate students. The graduate-level internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate their readiness for the North Carolina Standard Professional 1 (SP1) Professional Educator's License. Students are assigned to an appropriate classroom for a full-time semester-long experience under the supervision of the classroom teacher and University faculty. This internship can be done in a student's place of employment or the University can find placement for the student. Residency teachers and teacher assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the internship experience and licensure requirements. This contact should take place at least one semester before the internship.

Select one of the following:

- SPED 6475 - Internship/Seminar: Special Education K-12 - General Curriculum (3 to 6)
- SPED 6476 - Internship/Seminar: Special Education K-12 - Adapted Curriculum (3 to 6)

Phase II: Completion of the M.A.T. (14 credit hours)

Common Courses (8 credit hours)

- RSCH 7113 - Single-Case Research (3)
- SPED 6390 - Collaboration and Transition-Focused Education (2)
- SPED 6202 - Behavioral Assessment (3)

Concentration Courses (5 credit hours)

Select one of the following concentrations and its requirements based on the concentration completed during Phase I:

General Curriculum Concentration Courses

SPED 5377 - Advanced Literacy for Students with Disabilities (3)

SPED 5379 - Disability Supports in Content-area Classrooms (2)

Adapted Curriculum Concentration Courses

SPED 5371 - Person-Centered Planning for Students with Extensive Support Needs (3)

SPED 6225 - Behavior Analytic Intervention in Communication (3)

Capstone Experience (1 credit hour)

The capstone experience for the M.A.T. is fulfilled by completing the evidence project (Data-Based Decision Project) in SPED 6691. Candidates must be employed as a teacher during the semester of taking SPED 6691 or have completed at least one year of successful employment within the two years prior to enrolling in SPED 6691.

SPED 6691 - Seminar in Professional and Leadership Development (1)

Degree Total = 35 Credit Hours**Clinical Field Experiences**

Most courses require candidates to develop their knowledge, skills, and dispositions in public school settings. These experiences broaden their ability to help all students learn, including children/youth with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, candidates apply research and/or evidence-based practices gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. *All candidates are expected to complete clinical experiences in at least two significantly different settings.*

Candidates who are residency teachers and teacher assistants must move beyond their own classrooms and schools for at least two clinical experiences. Alternative settings must be approved by the instructor and may include schools on different schedules, afterschool, summer programs, Saturday programs, and private and charter schools. A limited number of clinical experiences may be approved in significantly different classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators.

Advising

Upon acceptance into the program, all candidates are assigned an advisor. Candidates are expected to meet with their advisor each semester to discuss their coursework.

Licensure

Upon successful completion of the M.A.T. Phase I/Graduate Certificate, candidates are recommended for the North Carolina Standard Professional 1 (SP1) Professional Educator's License. Upon successful completion of the M.A.T. Phase II, candidates are recommended for the North Carolina Standard Professional 2 (SP2) Professional Educator's License.

Graduate Certificate in Special Education

The Graduate Certificate in Special Education is a 21 credit hour program designed for students who do not hold a bachelor's degree in Special Education. Upon successful completion of the Graduate Certificate, students are eligible for the North Carolina Standard Professional 1 (SP1) Professional Educator's License in Adapted or General Curriculum.

The required courses for the Graduate Certificate are identical to Phase I of the M.A.T. Upon completion of the Graduate Certificate, qualified students have the option of continuing into Phase II to complete the M.A.T. Admission to the Graduate Certificate is separate and distinct from admission to a graduate degree program and not an indication of automatic admission to the M.A.T. degree program. For more information on this option, refer to the M.A.T. in Special Education.

All courses for the Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to admission information in the "Graduate School" section of this *Catalog*.

Admission Requirements for Graduate Certificate in Teaching Programs

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.75 (For alternative ways to demonstrate academic competence, applicants may contact the Office of Teacher Education Advising and Licensure (TEAL))

- 3) Two professional references in a supervisory capacity (i.e. principal or manager) and/or academic references (i.e. professor)
- 4) A statement of purpose
- 5) A clear criminal background check
- 6) Apply online at graduateschool.charlotte.edu

Certificate Requirements

Concentrations

Select one of the following concentrations and its requirements:

General Curriculum Concentration Courses (18 credit hours)

- SPED 5173 - Diagnostic Assessment (3)
- SPED 5300 - Lifespan Development for Exceptional Individuals (3)
- SPED 5370 - Multi-tiered Behavioral Supports (3)
- SPED 5372 - Planning Mathematics Instruction for Students with Exceptional Needs (3)
- SPED 5375 - Foundations of Literacy for Students with Disabilities (3)
- SPED 5400 - Practicum: Integrated Instructional Applications in Special Education (3)

Adapted Curriculum Concentration Courses (18 credit hours)

- SPED 5173 - Diagnostic Assessment (3)
- SPED 5274 - General Curriculum Access and Adaptations (3)
- SPED 5300 - Lifespan Development for Exceptional Individuals (3)
- SPED 5370 - Multi-tiered Behavioral Supports (3)
- SPED 5380 - Multiple Disabilities and Systematic Instruction (3)
- SPED 5400 - Practicum: Integrated Instructional Applications in Special Education (3)

Internship/Student Teaching (3 credit hours)

An internship is required for Graduate Certificate students. The graduate-level internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate their readiness for the North Carolina Standard Professional 1 (SP1) Professional Educator's License. Students are assigned to an appropriate classroom for a full-time semester-long experience under the supervision of the classroom teacher and University faculty. This internship can be done in a student's place of employment or the University can find placement for the student. Residency teachers and teacher assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the internship experience and licensure requirements. This contact should take place at least one semester before the internship.

SPED 6476 - Internship/Seminar: Special Education K-12 Adapted Curriculum (3 to 6)

Certificate Total = 21 Credit Hours

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisor at least once each semester.

Clinical Field Experiences

Most courses require students to develop their knowledge, skills, and dispositions in public school settings. These experiences broaden their ability to help all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, students apply research and/or evidence-based practices gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. All students are expected to complete clinical experiences in at least two significantly different settings.

Candidates who are residency teachers and teacher assistants must move beyond their own classrooms and schools for at least two clinical experiences. Alternative settings must be approved by the instructor and may include schools on different schedules, after-school and summer programs, Saturday programs, and private and charter schools. A limited number of clinical experiences may be approved in significantly different classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, students are recommended for the North Carolina Standard Professional 1 (SP1) Professional Educator's License. For this license, students are required to complete an electronic licensure portfolio that is created during coursework and the internship. Students apply for the North Carolina Standard Professional 1 (SP1) Professional Educator's License in the TEAL Office.

Graduate Certificate in Academically or Intellectually Gifted (AIG)

The Graduate Certificate in Academically or Intellectually Gifted (AIG) requires a 12 credit hour sequence of courses and provides a consistent, cohesive structure for teachers seeking to add on the North Carolina Standard Professional 1 (SP1) AIG Professional Educator's license. To be considered for admission to the Graduate Certificate (AIG licensure) Program, applicants must hold or be eligible for a North Carolina teaching license or its equivalent from another state. Applicants will need to hold a teaching position before enrolling in SPED 6124 and SPED 6224 in order to meet course requirements.

Admission Requirements for Graduate Certificate in Teaching Programs

- 1) A bachelor's degree from a college or university accredited by an accepted accrediting body
- 2) An Application for Admission to the Graduate School
- 3) Original transcripts that indicate a minimum overall GPA of at least 2.75 (*For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL)*)
- 4) A teaching license from North Carolina or its equivalent from another state
- 5) Recommendation letters and GRE or MAT scores are not required for applications to the Graduate Certificate in AIG, but are required for admission to the M.Ed. program

Notes: If accepted into the master's degree program, a maximum of twelve (12) Graduate Certificate hours may be applied toward the M.Ed. AIG degree, to elective requirements in other Special Education M.Ed. majors, or to other UNC Charlotte M.Ed. programs, with the permission of the program's Graduate Program Director and the student's academic advisor. Admission to the Graduate Certificate program does not ensure admission into a master's degree program. Applicants must take the GRE or MAT before applying to the Special Education master's degree program in AIG. Applicants who previously have received a grade of A in three (if the fourth course is in progress at the time of application) or all four of the 4 Graduate Certificate courses in AIG at UNC Charlotte may waive the GRE/MAT requirement. Students who have received one or more course grades below A in UNC Charlotte graduate certificate courses in AIG are not eligible for this waiver and must provide GRE or MAT scores with their application to the M.Ed.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Certificate Requirements

Required Course (12 credit hours)

- SPED 5211 - Nature and Needs of Gifted Students (3)
- SPED 6124 - Methods of Instructing Gifted Students (3)
- SPED 6161 - Social and Emotional Needs of Gifted Students (3)
- SPED 6224 - Adapting Curriculum Materials and Classroom Differentiation (3)

Certificate Total = 12 Credit Hours

Graduate Certificate in Applied Behavior Analysis

The Graduate Certificate in Applied Behavior Analysis offers 21 credit hours of coursework that have been verified by the Association for Behavior Analysis International toward the requirements for eligibility to take the Board Certified Behavior Analyst® examination. Applicants will need to meet additional requirements (including completion of a Master's degree and supervised field experiences) to be eligible to take the examination. Professionals such as teachers or therapists who wish to gain knowledge in the content area but do not plan to become board certified behavior analysts also make great candidates for the program.

General Requirements for Admission to the Graduate School

Please refer to admission information in the "Graduate School" section of this *Catalog*.

Admission Requirements

- A Bachelor's degree, or its equivalent, from a regionally accredited college or university
- GPA of at least 3.0 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school)
- An online application through the Graduate School's application system
- An essay of one to two pages describing the applicant's professional experience and objective in

pursuing the Graduate Certificate in Applied Behavior Analysis

- A copy of resume, listing the applicant's education and professional experience
- Unofficial transcripts of all college coursework attempted. Admitted students who plan to enroll will be required to submit their official transcript showing proof of a bachelor's degree to the Graduate Admissions department before the end of their first semester of enrollment.
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and he or she has not earned a post-secondary degree from a U.S. institution.

Certificate Requirements

Required Courses (21 credit hours)

The Graduate Certificate in Applied Behavior Analysis requires a 21-credit hour sequence of courses.

- RSCH 7113 - Single-Case Research (3)
- SPED 5200 - Concepts and Principles of Behavior Analysis (3)
- SPED 5201 - Science and Philosophy in Behavior Analysis (3)
- SPED 5202 - Supervision and Consultation in Behavior Analytic Programming (3)
- SPED 5203 - Ethics, Compliance, and Professionalism in Behavior Analysis (3)
- SPED 6225 - Behavior Analytic Intervention in Communication (3)
- SPED 6202 - Behavioral Assessment (3)

Special Policies or Requirements

- Students may apply credit earned as a post-baccalaureate student at UNC Charlotte toward this certificate with program approval. Up to six hours of transfer credit from another institution may be accepted with the approval of the Graduate Program Director or Verified Course Sequence (VCS) Coordinator and the Graduate School.
- Students may apply credit earned in this certificate toward the M. Ed. in Special Education and Child Development with a concentration in Applied Behavior Analysis. Applying credit toward a different graduate degree is at the discretion of the Graduate Program Director.
- Students who successfully complete the certificate with a 3.0 GPA and no more than one C grade and who wish to apply to the M. Ed. in Special Education and Child Development with a concentration in Applied Behavior Analysis must complete a new

application, meet admissions requirements, and would qualify for a waiver of the Graduate Record Examination (GRE) or the Miller Analogies Test (MAT). No course older than seven years may be applied toward a Master's degree.

Students must have an overall 3.0 GPA in the courses with no more than one C grade across the semesters in order to graduate and receive the graduate certificate.

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisor at least once each semester.

Certification

Students who are seeking graduate-level certification in behavior analysis (i.e., Board Certified Behavior Analyst) through the Behavior Analyst Certification Board (BACB) must also hold a master's degree and complete required supervised fieldwork in applied behavior analysis delineated by BACB to be eligible to sit for the certification examination. For details about requirements, refer to <https://www.bacb.com/bcba/>

Licensure

Completion of this graduate certificate program does NOT lead to a North Carolina Professional Educator's License.

Certificate Total = 21 Credit Hours

Graduate Certificate in Autism Spectrum Disorder (ASD)

The Graduate Certificate in Autism Spectrum Disorder is a 12-credit hour, non-licensure, online program. It serves two groups of professionals: (1) those who work in school districts and are responsible for teaching individuals with Autism Spectrum Disorder and for developing appropriate individualized education programs that include academic instruction and effective intervention practices in the areas of communication, daily living, and social skills; and (2) those who work in human service agencies and are responsible for providing intervention practices in the areas of communication, daily living, and social skills as well as preparing individuals with Autism Spectrum Disorder to live, work, and learn as adults.

Program Objectives

As specialists in public schools and human service agencies in the area of autism spectrum disorder, completers of the program are prepared to:

- Work as public school teachers in a broad range of

educational settings including the general education classroom and special education programs

- Work as human service agency personnel implementing research-validated intervention strategies for children, youth, and adults in community agencies
- Implement research-validated instruction/intervention strategies for children, youth, and young adults with autism spectrum disorder
- Assess the effectiveness of individualized instruction/intervention programs for individuals with autism spectrum disorder

Admission Requirements for Graduate Certificate in Teaching Programs

- A bachelor's degree in education or a related field of study from a college or university accredited by an accepted accrediting body
- Official transcripts of all previous work beyond high school documenting an overall grade point average of at least 3.0 (based on a 4.0 scale)
- An essay of one to two pages describing the applicant's experience and objective in pursuing the graduate certificate
- Apply online at gradadmissions.charlotte.edu

Applicants to the Graduate Certificate in ASD are not required to take the GRE or MAT. However, individuals who are interested in completing the ASD Graduate Certificate as part of the M.Ed. in Special Education degree must take the GRE or MAT to meet the admissions requirements for the M.Ed. in Special Education. If accepted into the master's degree program, a maximum of twelve (12) Graduate Certificate hours may be applied toward the M.Ed. degree program in Special Education with the permission of the Graduate Program Director. Admission to the Graduate Certificate program does not ensure admission into a master's degree program.

Certificate Requirements

The Graduate Certificate in Autism Spectrum Disorder requires a 12-credit hour sequence of courses. No transfer credit is accepted.

Required Courses (12 credit hours)

SPED 5200 - Concepts and Principles of Behavior Analysis (3)
 SPED 6115 - Introduction to Autism Spectrum Disorder (3)
 SPED 6225 - Behavior Analytic Intervention in Communication (3)
 SPED 6335 - Evidence-Based Practices for Learners with Autism Spectrum Disorder (3)

Certificate Total = 12 Credit Hours

Grade Requirements

Students must earn grades of B or above in each of the courses in the 12-credit hour program of study.

TEACHING ENGLISH AS A SECOND LANGUAGE

- Ph.D. in Curriculum and Instruction*
- M.Ed. in Middle Grades and Secondary Education*
- M.A.T. in English as a Second Language
- Graduate Certificate in Teaching English as a Second Language

**The Ph.D. in Curriculum and Instruction and M.Ed. in Middle and Secondary Grades each offer a Concentration in Teaching English as a Second Language. Information about these related programs can be found under the Curriculum and Instruction heading of this Graduate Catalog.*

Department of Middle, Secondary and K-12 Education

mdsk.charlotte.edu

M.A.T. in English as a Second Language

The Master of Arts in Teaching (M.A.T.) English as a Second Language (ESL) program is designed for individuals with a bachelor's degree (in any area) interested in teaching English Language Learners (ELL) in K-12 public schools. The M.A.T. program is a 30 credit hour program comprised of two phases: the Graduate Certificate phase (Phase I) and the Master's degree completion phase (Phase II). Completion of Phase I (Graduate Certificate) leads to the initial Standard Professional I teaching license in Teaching English as a Second Language (TESL). Phase I requires 18 credit hours of coursework, including a required graduate student teaching/internship experience. Upon completion of Phase I and formal acceptance into the M.A.T. program by the Graduate School, qualified candidates may continue into Phase II to complete the remaining requirements for the Master's degree and qualify for the advanced Standard Professional II teaching license. Applications must be submitted to the Graduate School for formal admission to the Graduate Certificate program in TESL (Phase I). Upon completion of Phase I, another application must be submitted for formal admission to the Master's program (Phase II).

General Requirements for Admission to the Graduate School

Please refer to general information provided in The Graduate School section of this *Catalog*.

Admission Requirements for all M.A.T. Programs

- 1) Successful completion of the Graduate Certificate in Teaching
- 2) GRE or Miller Analogies Test scores are required for students with GPAs that do not meet minimum requirements*
- 3) Three recommendation letters that include at least one from a full-time faculty member who has taught the student in the Graduate Certificate in Teaching English as a Second Language program
- 4) A statement of purpose (500-1000 words)
- 5) Apply online at graduateschool.charlotte.edu

There may be additional requirements (at the discretion of the Graduate Program Director) for admittance to the TESL Master's program. The admission process includes timely completion of the Admission to Candidacy form and the Application for Graduation from the Graduate Certificate program.

** Test scores may be waived if students complete the Graduate Certificate in Teaching with a minimum GPA of 3.5.*

Degree Requirements

Phase I: Graduate Certificate Courses (18 credit hours)

Required Courses (15 credit hours)

MDSK 6162 - Planning for K-12 Instruction (3)

TESL 5103 - Methods in Teaching English as a Second Language (3)

TESL 5104 - Authentic Assessment (3)

TESL 5204 - Learning, Schools, and Community
or TESL 6204 - Multicultural Education (3)

TESL 5205 - Second Language Acquisition in K-12 Schools (3)

or ENGL 6163 - Understanding Language Learning: Mind, Identity, and the Sociocultural World (3)

Internship/Student Teaching (3 credit hours)

The graduate-level student teaching/internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. Students are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and university faculty. Residency teachers and teacher assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship experience and licensure requirements. This contact should take place at least one

semester before student teaching.

TESL 6470 - Internship in Teaching English as a Second Language (3 to 6) **

*** TESL 6470 is a full-time internship requiring employment as an English as a Second Language teacher in an approved school or a non-paid placement with a licensed ESL teacher in a public school. It requires a formal application and approval during the semester prior to the internship.*

Phase II: Completion of M.A.T. Courses (12 credit hours)

Note: All requirements of Phase I should be completed before beginning Phase II.

Required Courses (9 credit hours)

MDSK 6260 - Teacher Leadership (3)

TESL 6276 - Advanced Pedagogy in Teaching English as a Second Language (3)

TESL 6691 - Seminar in Professional Development (3)
or MDSK 6691 - Seminar in Professional Development (3)s

Elective Course (3 credit hours)

Select one of the following:

ENGL 6161 - Introduction to Linguistics (3)

READ 6204 - Teaching Reading to English Language Learners (3)

RSCH 6101 - Research Methods (3)

TESL 6206 - Globalization, Communities, and Schools (3)

An approved Study Abroad program ***

An approved course substitution (3)

**** Written approval for any study abroad experiences and/or elective courses not listed here must be provided in advance by the Graduate Program Director.*

Degree Total = 30 Credit Hours

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisors at least once each semester.

Clinical Field Experiences

Most courses require students to develop their knowledge, skills, and dispositions in public school/agency settings. All students are expected to complete clinical experiences in at least two significantly diverse settings. Clinical field experiences provide opportunities for helping all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, students apply theories and understandings gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. All students are

expected to complete clinical experiences in at least two different settings. Upon approval from course instructors, these structured experiences can take place in multiple settings such as neighboring schools or districts, day care centers and after-school programs, alternate youth centers, community organizations, non-profit organizations, or in the schools and classrooms in which the candidates work.

Candidates who are lateral entry teachers and teacher assistants must move beyond their own classrooms and schools for at least two clinical experiences. Alternative settings must be approved by the instructor. A limited number of clinical experiences may be approved in significantly different classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, students are recommended for the North Carolina initial Standard Professional I teaching license. For this initial license, students are required to complete an electronic licensure portfolio that is created during coursework and student teaching. Upon successful completion of Phase II, students are recommended for the North Carolina advanced Standard Professional II teaching license. For the advanced license, students are required to complete an advanced electronic licensure portfolio during coursework.

Graduate Certificate in Teaching English as a Second Language

The Graduate Certificate in Teaching English as a Second Language (TESL) is an 18-credit hour program which includes a required graduate student teaching/internship experience. The Graduate Certificate is designed for students who hold a bachelor's degree and wish to teach English as a Second Language in K-12 settings. Completion of the Graduate Certificate leads to the initial Standard Professional I teaching license in Teaching English as a Second Language.

The required courses for the Graduate Certificate are identical to Phase I of the M.A.T. Upon completion of Phase I and formal acceptance into the M.A.T. program by the Graduate School, qualified candidates may continue into Phase II to complete the remaining requirements for the Master's degree and qualify for the advanced Standard Professional II teaching license. Applications must be submitted to the Graduate School for formal admission to the Graduate Certificate Program in TESL (Phase I). Upon completion of Phase I, another application must be submitted for formal admission to the Master's program.

Admission to the Graduate Certificate is separate and distinct from admission to a graduate degree program and not an indication of automatic admission to the M.A.T. degree program. For more information on this option, refer to the M.A.T. in Teaching English as a Second Language.

All courses for the Graduate Certificate must be completed within five years.

General Requirements for Admission to the Graduate School

Please refer to general information provided in The Graduate School section of this *Catalog*.

Admission Requirements for all Graduate Certificates in Teaching programs

- 1) An undergraduate degree from a college or university accredited by an accepted accrediting body
- 2) A cumulative undergraduate GPA of 2.75 (*For alternative ways to demonstrate academic competence, contact the Office of Teacher Education Advising and Licensure (TEAL)*)
- 3) Two professional references in a supervisory capacity (i.e. principal or manager) and/or academic references (i.e. professor)
- 4) Statement of purpose (500-1000 words)
- 5) Clear criminal background check
- 6) Apply online at graduateschool.charlotte.edu

Certificate Requirements

Required Courses (15 credit hours)

MDSK 6162 - Planning for K-12 Instruction (3)
 TESL 5103 - Methods in Teaching English as a Second Language (3)
 TESL 5104 - Authentic Assessment (3)
 TESL 5204 - Learning, Schools, and Community or TESL 6204 - Multicultural Education (3)
 TESL 5205 - Second Language Acquisition in K-12 Schools (3)
 or ENGL 6163 - Understanding Language Learning: Mind, Identity, and the Sociocultural World (3)

Internship/Student Teaching (3 credit hours)

The graduate-level student teaching/internship is the culminating experience of the Graduate Certificate program, offering students the opportunity to demonstrate their readiness for the initial Standard Professional I teaching license. Students are assigned to an appropriate classroom for a full-time, semester-long experience under the supervision of the classroom teacher and university faculty. Residency teachers and teacher assistants must contact the Office of School and Community Partnerships to determine the appropriateness of their classroom for the student teaching/internship experience and licensure

requirements. This contact should take place at least one semester before student teaching.

TESL 6470 - Internship in Teaching English as a Second Language (3 to 6)*

**TESL 6470 is a full-time internship requiring employment as an English as a Second Language teacher in an approved school or a non-paid placement with a licensed ESL teacher in a public school. It required application and approval during the semester prior to the internship.*

Certificate Total = 18 Credit Hours

Advising

All students are assigned an advisor upon formal admission to the program. Students should consult with their advisors at least once each semester.

Clinical Field Experiences

Most courses require students to develop their knowledge, skills, and dispositions in public school settings. These experiences broaden their ability to help all students learn, including children with exceptionalities and students from diverse ethnic/racial, linguistic, gender, and socioeconomic groups. During clinical experiences, students apply theories and understandings gained in coursework, analyze P-12 student learning, and develop the ability to positively impact all learners. All students are expected to complete clinical experiences in at least two significantly diverse settings.

Candidates who are lateral entry teachers and teacher assistants must move beyond their own classrooms and schools for at least two clinical experiences. Alternative settings must be approved by the instructor and may include schools on different schedules, after-school and summer programs, Saturday programs, private, and charter schools. A limited number of clinical experiences may be approved in significantly different classrooms within their school of employment. Employed candidates are encouraged to seek assistance and support from their administrators.

Licensure

Upon successful completion of the Phase I/Graduate Certificate, students will be recommended for the North Carolina initial Standard Professional I teaching license. For this license, students are required to complete an electronic licensure portfolio that is created during coursework and student teaching.

URBAN EDUCATION

- M.Ed. in Urban Education
- Graduate Certificate in Self, Systems and Social Transformation (SSST)

Department of Middle, Secondary, and K-12 Education

mnsk.charlotte.edu

Department of Reading and Elementary Education

reel.charlotte.edu

M.Ed. in Urban Education

The M.Ed. in Urban Education is a fully online degree program designed to prepare education professionals who are committed to delivering high-quality, culturally relevant/sustaining instruction and services that meet the needs of students in increasingly diverse, urban school systems across the United States. UNC Charlotte is particularly focused on providing professionals with practical tools and resources that increase multicultural competence and awareness. To achieve its objectives, the program aims to equip teachers, administrators, paraprofessionals, counselors, and those alike -- who currently work or aspire to work in, or with, urban schools -- with practical approaches to implementing evidenced-based best practices that improve the educational experiences and academic outcomes of racially, linguistically, socioeconomically, and culturally diverse populations. Students who graduate with an M.Ed. in Urban Education from UNC Charlotte not only gain a pedagogical (instructional) skill set that informs their understanding of culturally responsive/sustaining teaching practices, but they are also trained to recognize and examine larger issues related to culture, race, and racism that influences the quality of non-academic services (counseling, mentoring, social/behavioral support, etc.) prospective graduates may provide to urban communities.

The M.Ed. in Urban Education requires 33 credit hours of coursework. The program is designed as a cohort model that admits students as a group beginning each Fall semester. Students admitted to this selective online program average two (2) courses per semester and are expected to complete the program in two (2) years (including one full Summer term).

Admission Requirements

The minimum admission requirements for the M.Ed. in Urban Education program are:

- An earned undergraduate degree from a college or university accredited by an accepted accrediting body
- An undergraduate GPA of 3.0 or above
- An official transcript of previous academic coursework beyond high school
- Three (3) professional letters of recommendation from education professionals to speak to the benefit of this program for the professional growth of the candidate
- A statement of purpose for entering a M.Ed. in Urban Education online program
- TOEFL scores if applicable (Students for whom English is not the primary language must submit scores from the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or Pearson Test of English (PTE))
- Other credentials required by the Graduate School (gradadmissions.charlotte.edu/apply-now/application-requirements)

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required.

Degree Requirements

Required Courses (21 credit hours)

EDCI 6120 - Media Literacies and Pedagogy in Education (3)
 EDCI 6201 - Storying Schools (3)
 EDUC 5100 - 21st Century Learners (3)
 EDUC 6101 - Youth Leadership and Family Engagement (2 to 3)
 MDSK 6691 - Seminar in Professional Development (3)
 RSCH 6101 - Research Methods (3)
 TESL 6206 - Globalization, Communities, and Schools (3)

Elective Courses (12 credit hours)

EDUC 6000 - Topics in Education (1 to 6)
 ELED 6260 - Psychological and Historical Influences on Society (3)
 ELED 6261 - Human Identity Development (3)
 ELED 6262 - Social Dynamics and Systems that Educate (3)
 ELED 6263 - Social Action and Advocacy (3)
 MDSK 6150 - Models of Teaching (3)
 MDSK 6156 - Curriculum, Teaching, and Contemporary Issues in Education (3)
 MDSK 6220 - Adolescence and Learning (2 or 3)
 MDSK 6252 - Differentiated Instruction for Adolescent Learners (1 to 3)
 MDSK 6262 - AI and EdTech in the Classroom (3)

Capstone Requirement

All students must submit a professional portfolio as part of MDSK 6691 to meet their capstone requirement.

Grade Requirements

While enrolled in the M.Ed. in Urban Education program, students are expected to earn a grade of A or B in all courses, maintaining a minimum cumulative 3.0 GPA (on a 4.0 scale) to graduate. The capstone project is assessed on a Pass/Unsatisfactory basis and is not included in the cumulative average. An accumulation of three (3) marginal C grades in any graduate coursework results in automatic suspension of enrollment. If students earn a grade of a U in any course, their enrollment is suspended and they are not be able to progress without being readmitted to the program. Readmission to the program requires approval from the Dean of the Graduate School upon the recommendation of the Graduate Program Director.

Degree Total = 33 Credit Hours

Graduate Certificate in Self, Systems and Social Transformation (SSST)

This interdisciplinary graduate certificate equips students with the intellectual tools and practical frameworks to critically examine self, social systems, and change. Designed for educators, professionals across industries, and community leaders, this program cultivates a rigorous, action oriented approach to inquiry with opportunities to enhance their leadership, critical thinking, problem-solving, and strategic-thinking skills to address issues that affect their communities, ultimately resulting in positive transformation.

Admission Requirements

In general, admission requirements for the Graduate Certificate are:

- A bachelor's degree, or its equivalent, from a college or university accredited by an accepted accredited body
- GPA of at least 2.75 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school).
- An online application through the Graduate School's application system
- A statement of purpose
- Unofficial transcripts of all college coursework attempted
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution

Note: Given that certificates are not degree programs and are intended to provide streamlined educational opportunities, standardized test scores (e.g., GRE, GMAT, MAT) are not required for admission.

Certificate Requirements

Required Courses (12 credit hours)

ELED 6260 - Psychological and Historical Influences on Society (3)

ELED 6261 - Human Identity Development (3)

ELED 6262 - Social Dynamics and Systems that Educate (3)

ELED 6263 - Social Action and Advocacy (3)

Grade Requirements

A grade of A or B must be received in all courses.

Certificate Total = 12 Credit Hours



The William States Lee College of Engineering

engr.charlotte.edu

The William States Lee College of Engineering at the University of North Carolina at Charlotte is one of the finest engineering colleges in the Southeast. Emphasizing applied research in its educational programs, the college prepares students for careers in engineering through meaningful hands-on involvement and interactive teamwork. Students and faculty work with government, the private sector, and other universities to develop practical advances in technology. Locally and throughout the world, their efforts affect positive economic and environmental change.

With cross-disciplinary expertise and capabilities, UNC Charlotte's renowned engineering research centers provide the tools to tackle real-world challenges in a strong academic environment. The centers, together with the funded research programs of the faculty, support graduate programs in the Departments of Civil and Environmental Engineering, Electrical and Computer Engineering, Engineering Technology and Construction Management, Industrial and Systems Engineering, and Mechanical Engineering and Engineering Science.

Civil and Environmental Engineering

Faculty from the Department of Civil and Environmental Engineering focus their research on the built environment and developing resilient and sustainable solutions. These solutions are created through numerical, laboratory, and field-based research. Faculty are active participants in the University's Infrastructure, Design, Environment, and Sustainability Center (IDEAS) and the Center for Advanced Multimodal Mobility Solutions and Education (CammSE). The department, in conjunction with the Department of Geography and Earth Sciences, also assumes a key role in

the interdisciplinary Infrastructure and Environmental Systems doctoral program.

Electrical and Computer Engineering

The Department of Electrical and Computer Engineering (ECE) offers multidisciplinary programs leading to M.S. and Ph.D. degrees in Electrical and Computer Engineering. Students are provided with breadth of knowledge in electrical and computer engineering and depth of knowledge in their chosen research area. The department is staffed with a prestigious faculty conducting research in various areas that include: communications, networking, signal and image processing, control systems, robotics, embedded systems, computer vision, machine learning, AI, high performance computing, RF systems, metamaterials and metasurfaces, ultra low-power electronic devices, optoelectronics, microelectronics, power systems modeling and analysis, power systems stability and control, smart grids and micro-grids, renewable energy, power electronics, and many others. The department has a full range of state-of-the-art laboratories, enabling faculty and students to conduct research at the cutting-edge of technology. ECE faculty are also associated with several interdisciplinary centers such as the Energy Production and Infrastructure Center (EPIC), the Center for Metamaterials (CFM), the Center for Optoelectronics and Optical Communications, and the North Carolina Battery Complexity, Autonomous Vehicle and Electrification Research Center (BATT CAVE).

Engineering Technology and Construction Management

The college offers graduate programs in Applied Energy and Electromechanical Engineering, Construction and Facilities Engineering, and Fire Protection and Safety Management through the Department of Engineering Technology and Construction Management. These programs focus on applied technology and meet the requirements for expanded education and training in these growing areas of technical importance.

Industrial and Systems Engineering

The Center for Lean Logistics and Engineered Systems provides industry access to the expertise of the Department of Industrial and Systems Engineering faculty assisting them in remaining competitive in global markets. The faculty provide educational opportunities ranging from traditional coursework to continuing education. The offerings span topics from healthcare to energy analytics and industrial systems optimization. The faculty also participates in the Infrastructure and Environmental Systems doctoral program.

Mechanical Engineering and Engineering Science

The Center for Precision Metrology, under the direction of the Department of Mechanical Engineering and Engineering Science, helps manufacturers in many industries, including automotive, aircraft, and computer manufacturing to produce perfect parts through the aid of state-of-the-art measurement systems. The center's measurement capability ranges from the atomic scale in environmentally controlled laboratories to meter scale parts in the Siemens Energy Large Manufacturing Solutions Laboratory. The department's research programs in computational modeling and the Center for Biomedical Engineering and Science focus on improving the design, control, and manufacturing of engineered and biological systems. The North Carolina Motorsports and Automotive Research Center provides an opportunity to develop systems for the next generation of vehicles as well as providing a platform for development in automotive competition.

Graduate Degree Programs

- M.S. in Engineering Management
 - M.S. in Fire Protection and Safety Management
 - M.S. in Mechanical Engineering
 - Graduate Certificate in Applied Energy
 - Graduate Certificate in Precision Metrology
-
- Ph.D. in Civil Engineering
 - Ph.D. in Electrical Engineering
 - Ph.D. in Infrastructure and Environmental Systems
 - Ph.D. in Mechanical Engineering
 - M.S. in Applied Energy and Electromechanical Engineering
 - M.S. in Civil Engineering
 - M.S. in Computer Engineering
 - M.S. in Construction and Facilities Engineering
 - M.S. in Electrical Engineering
 - M.S. in Engineering

CIVIL AND ENVIRONMENTAL ENGINEERING

- **Ph.D. in Civil Engineering**
 - o Environmental and Water Resources Engineering
 - o Geo-Environmental Engineering
 - o Geotechnical Engineering
 - o Structural Engineering
 - o Transportation Engineering
- **Ph.D. in Infrastructure and Environmental Systems** *(see the Infrastructure and Environmental Systems heading)*
- **M.S. in Civil Engineering**
 - o Environmental and Water Resources Engineering
 - o Geo-Environmental Engineering
 - o Geotechnical Engineering
 - o Structural Engineering
 - o Transportation Engineering
- **M.S. in Engineering**
 - o Environmental and Water Resources Engineering
 - o Geo-Environmental Engineering
 - o Geotechnical Engineering
 - o Structural Engineering
 - o Transportation Engineering

Department of Civil and Environmental Engineering
cee.charlotte.edu

Ph.D. in Civil Engineering

The Department of Civil and Environmental Engineering (CEE) provides opportunities for discipline-specific and multidisciplinary graduate-level and doctoral-level education in Civil and Environmental Engineering and closely related areas. Advanced coursework and capstone research experience are used to enhance professional development, improve technical competency, and engage in a life-long learning experience. CEE has ongoing collaborative research and student exchange programs with several international institutions that add value and further enrich the experience.

The department offers doctoral studies leading to a Civil Engineering Ph.D. degree in five areas of concentration:

- 1) Environmental Engineering
- 2) Geo-Environmental Engineering
- 3) Geotechnical Engineering

- 4) Structural Engineering
- 5) Transportation Engineering

Doctoral students engage in courses of study leading to the doctoral degree, becoming competent in selected topics required for completion of research at the doctoral level. During this process, doctoral students acquire knowledge, demonstrate abilities to research on advanced topics in engineering, and communicate technical information effectively. They also discover and create new knowledge, and understand interactions among advanced topics in engineering. The development of such skills helps doctoral students to function and excel professionally.

Doctoral studies leading to the Ph.D. in Infrastructure and Environmental Systems (INES) are available through an interdisciplinary, inter-college program. See the "Infrastructure and Environmental Systems" heading in this section for details.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, CEE seeks the following from applicants to the doctoral program:

Applicants with a Master's Degree in Civil Engineering (Eligible to Pursue the Ph.D. Degree with Advanced Standing)

Doctoral students who hold a relevant master's degree in Civil Engineering or related field, either from UNC Charlotte or another institution, may be eligible to pursue the Ph.D. degree with Advanced Standing. Eligibility for this accelerated option must be made at the time of admission to the program, and is subject to review by the Graduate School. Requirements for admission include:

- An earned master's degree in Civil, Environmental, Structural, or Transportation Engineering, or a closely related Engineering master's degree
- A master's degree GPA of 3.0 or above
- A satisfactory GRE score (The GRE requirement will be waived for students who are currently enrolled in the MSE/MSCE program at UNC Charlotte, or have completed an MSE program in a different department at UNC Charlotte.)
- A statement of purpose
- Three letters of recommendation
- An acceptable English proficiency score as required by UNC Charlotte for international students
- Any other appropriate credentials as required by the Graduate School

Applicants with a Bachelor's Degree in Civil Engineering (Eligible to Pursue the Ph.D. Degree)

Doctoral students who hold a bachelor's degree in Civil

and/or Environmental Engineering, either from UNC Charlotte or from an ABET-accredited college or university, may be eligible to pursue the Ph.D. degree. Requirements for admission include:

- An earned bachelor's degree in Civil and/or Environmental Engineering from an ABET-accredited college or university
- A bachelor's degree minimum GPA of 3.0
- A satisfactory GRE score
- A statement of purpose
- Three letters of recommendation
- An acceptable English proficiency score as required by UNC Charlotte for international students
- Any other appropriate credentials as required by the Graduate School

Notes:

Admission for applicants currently in the MSCE program at UNC Charlotte requires a minimum GPA of 3.0, completion of all core courses in their area of concentration, completion of at least 15 credit hours at master's level, and acceptance by the Graduate School to the doctoral program at UNC Charlotte.

Admission for applicants without an undergraduate degree in Civil Engineering requires completion of MSE degree with emphasis in one of the five areas of concentration and GPA of 3.0 or above.

Early Entry Program

Current MSCE students at UNC Charlotte with outstanding academic performance, and satisfying the requirements described above, may be admitted to the Early Entry Program to pursue doctoral study while completing the master's degree requirements. Early Entry doctoral students are dually enrolled with both master's and doctoral status, and may complete up to 15 credit hours toward their doctoral degree prior to graduating with their master's degree.

Application Deadline

Applications for admission must be submitted online directly to the Graduate School. They may be submitted any time prior to April 1 for Fall admission, and October 1 for Spring admission. To be considered for assistantships and tuition grants for the following academic year, potential applicants must apply and submit all required documents by March 1.

Degree Requirements

Requirements for Doctoral Students with a Master's Degree in Civil Engineering (Pursuing the Ph.D. Degree with Advanced Standing)

Under the Advanced Standing option, students must complete 42 credit hours of civil engineering courses,

including only 18 credit hours of dissertation research. The remaining 24 credit hours under this option are determined by the student's concentration. With the approval of the doctoral research advisor and Graduate Program Director, a maximum of three doctoral-level courses (outside CEGR or within CEGR) related to the dissertation topic or the student's area of concentration may be incorporated into the credit hour requirement. Note that each doctoral student with Advanced Standing is limited to one individual study class within the 42-credit hour requirement. All doctoral students must also complete GRAD 8302 (Responsible Conduct of Research) and GRAD 8990 (Academic Integrity) as a Graduate School requirement.

Graduate School Required Courses

GRAD 8302 Responsible Conduct of Research (2)
GRAD 8990 Academic Integrity (0)

Concentration Courses (24 credit hours)

Select 24 credit hours from the appropriate concentration:

Environmental Engineering Concentration

CEGR 8090 - Special Topics (3) (*Environmental Engineering topic*)

CEGR 8141 - Water Quality Modeling (3)

CEGR 8144 - Environmental Biotechnology (3)

CEGR 8151 - Research Methods (3)

CEGR 8163 - GIS for Civil Engineers (3)

CEGR 8173 - Environmental Aquatic Chemistry (3)

CEGR 8244 - Chemical Fate and Transport (3)

CEGR 8892 - Individualized Study (3)

Geo-Environmental Engineering Concentration

CEGR 8090 - Special Topics (3) (*Geo-Environmental Engineering topic*)

CEGR 8151 - Research Methods (3)

CEGR 8163 - GIS for Civil Engineers (3)

CEGR 8244 - Chemical Fate and Transport (3)

CEGR 8251 - Foundation Engineering (3)

CEGR 8252 - Soil Dynamics and Earthquake Engineering (3)

CEGR 8254 - Experimental Soil Mechanics (3)

CEGR 8268 - Advanced Soil Mechanics (3)

CEGR 8892 - Individualized Study (3)

Geotechnical Engineering Concentration

CEGR 8090 - Special Topics (3) (*Geotechnical Engineering topic*)

CEGR 8151 - Research Methods (3)

CEGR 8163 - GIS for Civil Engineers (3)

CEGR 8251 - Foundation Engineering (3)

CEGR 8252 - Soil Dynamics and Earthquake Engineering (3)

CEGR 8254 - Experimental Soil Mechanics (3)

CEGR 8268 - Advanced Soil Mechanics (3)

CEGR 8892 - Individualized Study (3)

Structural Engineering Concentration

CEGR 8090 - Special Topics (3) (*Structural Engineering topic*)
 CEGR 8124 - Masonry Design (3)
 CEGR 8125 - Structural Strengthening (3)
 CEGR 8126 - Analysis of Plates and Shells (3)
 CEGR 8127 - Fracture Mechanics and Fatigue (3)
 CEGR 8128 - Structural Optimization (3)
 CEGR 8129 - Structural Dynamics (3)
 CEGR 8151 - Research Methods (3)
 CEGR 8163 - GIS for Civil Engineers (3)
 CEGR 8222 - Experimental Structural Mechanics and Nondestructive Evaluation (3)
 CEGR 8223 - Introduction to Structures in Fire (3)
 CEGR 8224 - Introduction to Power Transmission Structure Designs (3)
 CEGR 8225 - Forensic Investigations (3)
 CEGR 8226 - Structural Systems (3)
 CEGR 8892 - Individualized Study (3)
 MEGR 8141 - Theory of Elasticity I (3)

Transportation Engineering Concentration

CEGR 8090 - Special Topics (3) (*Transportation Engineering topic*)
 CEGR 8151 - Research Methods (3)
 CEGR 8161 - Traffic Control and Operation (3)
 CEGR 8162 - Computer Applications for Transportation Engineers (3)
 CEGR 8163 - GIS for Civil Engineers (3)
 CEGR 8164 - Traffic Safety (3)
 CEGR 8166 - Urban Transportation Networks: Operations and Optimization (3)
 CEGR 8167 - Discrete Choice Modeling (3)
 CEGR 8181 - Traffic Flow Theory (3)
 CEGR 8182 - Transportation Systems Analysis (3)
 CEGR 8892 - Individualized Study (3)

Dissertation Research Course (18 credit hours)

The following course must be repeated for a total and maximum of 18 credit hours:

CEGR 8991 - Doctoral Dissertation (1 to 6)

Degree Total = 42 Credit Hours

Requirements for Doctoral Students with a Bachelor's Degree in Civil Engineering (Pursuing the Ph.D. Degree)

Under this option, students must complete 72 credit hours of civil engineering courses, including only 18 credit hours of dissertation research. The remaining 54 credit hours under this option are determined by the student's concentration. At least 39 credit hours of these remaining requirements must be in courses numbered 8000 or above. With the approval of the doctoral research advisor and Graduate Program Director, a maximum of three doctoral-level courses (outside CEGR or within

CEGR) related to the dissertation topic or the student's area of concentration may be incorporated into the credit hour requirement. Note that each doctoral student is limited to two individual study classes within the 72-credit hour requirement. All doctoral students must also complete GRAD 8302 (Responsible Conduct of Research) and GRAD 8990 (Academic Integrity) as a Graduate School requirement.

Graduate School Required Courses

GRAD 8302 - Responsible Conduct of Research (2)
 GRAD 8990 - Academic Integrity (0)

Concentration Courses (54 credit hours)

Select 54 credit hours from the appropriate concentration:

Environmental Engineering Concentration

Required Courses

Students pursuing the environmental concentration will work with their research advisor and professional advisor to develop a plan of study specific to their interests. The plan of study will need to be 54 credit hours total, and coursework should be selected from the list of "Elective Courses" below.

Elective Courses

CEGR 5090 - Special Topics in Civil Engineering (1 to 4) (*Environmental Engineering topic*)
 CEGR 5142 - Water Treatment Engineering (3)
 CEGR 5144 - Engineering Hydrology (3)
 CEGR 5145 - Groundwater Resources Engineering (3)
 CEGR 5146 - Advanced Engineering Hydraulics (3)
 CEGR 5147 - Stormwater Management (3)
 CEGR 5242 - Wastewater Treatment Plant Design (3)
 CEGR 5247 - Sustainability (3)
 CEGR 8090 - Special Topics (3) (*Environmental Engineering topic*)
 CEGR 8141 - Water Quality Modeling (3)
 CEGR 8144 - Environmental Biotechnology (3)
 CEGR 8151 - Research Methods (3)
 CEGR 8163 - GIS for Civil Engineers (3)
 CEGR 8173 - Environmental Aquatic Chemistry (3)
 CEGR 8244 - Chemical Fate and Transport (3)
 CEGR 8892 - Individualized Study (3)

Geo-Environmental Engineering Concentration

Required Courses

CEGR 5145 - Groundwater Resources Engineering (3)
 CEGR 5264 - Landfill Design and Site Remediation (3)

Elective Courses

CEGR 5090 - Special Topics in Civil Engineering (1 to 4) (*Geo-Environmental Engineering topic*)
 CEGR 5264 - Landfill Design and Site Remediation (3)
 CEGR 5270 - Earth Pressures and Retaining Structures (3)
 CEGR 5271 - Pavement Design (3)
 CEGR 5272 - Design with Geosynthetics (3)

CEGR 5273 - Engineering Ground Improvement (3)
 CEGR 5278 - Geotechnical Engineering II (3)
 CEGR 8090 - Special Topics (3) (*Geo-Environmental Engineering topic*)
 CEGR 8151 - Research Methods (3)
 CEGR 8163 - GIS for Civil Engineers (3)
 CEGR 8244 - Chemical Fate and Transport (3)
 CEGR 8251 - Foundation Engineering (3)
 CEGR 8252 - Soil Dynamics and Earthquake Engineering (3)
 CEGR 8254 - Experimental Soil Mechanics (3)
 CEGR 8268 - Advanced Soil Mechanics (3)
 CEGR 8892 - Individualized Study (3)

Geotechnical Engineering Concentration

Required Courses

CEGR 5270 - Earth Pressures and Retaining Structures (3)
 CEGR 8251 - Foundation Engineering (3)
 CEGR 8254 - Experimental Soil Mechanics (3)
 CEGR 8268 - Advanced Soil Mechanics (3)

Elective Courses

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
 (*Geotechnical Engineering topic*)
 CEGR 5145 - Groundwater Resources Engineering (3)
 CEGR 5264 - Landfill Design and Site Remediation (3)
 CEGR 5271 - Pavement Design (3)
 CEGR 5272 - Design with Geosynthetics (3)
 CEGR 5273 - Engineering Ground Improvement (3)
 CEGR 5278 - Geotechnical Engineering II (3)
 CEGR 8090 - Special Topics (3) (*Geotechnical Engineering topic*)
 CEGR 8151 - Research Methods (3)
 CEGR 8163 - GIS for Civil Engineers (3)
 CEGR 8251 - Foundation Engineering (3)
 CEGR 8252 - Soil Dynamics and Earthquake Engineering (3)
 CEGR 8254 - Experimental Soil Mechanics (3)
 CEGR 8268 - Advanced Soil Mechanics (3)
 CEGR 8892 - Individualized Study (3)

Structural Engineering Concentration

Required Courses

CEGR 5108 - Finite Element Analysis and Applications (3)
 CEGR 5222 - Structural Steel Design II (3)
 CEGR 5224 - Advanced Structural Analysis (3)
 CEGR 5226 - Reinforced Concrete Design II (3)
 CEGR 8129 - Structural Dynamics (3)

Elective Courses

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
 (*Structural Engineering topic*)
 CEGR 5125 - Forensic Engineering (3)
 CEGR 5126 - Codes, Loads, and Nodes (3)
 CEGR 5128 - Matrix Methods of Structural Analysis (3)
 CEGR 5223 - Timber Design (3)
 CEGR 8090 - Special Topics (3) (*Structural Engineering topic*)
 CEGR 8124 - Masonry Design (3)

CEGR 8125 - Structural Strengthening (3)
 CEGR 8126 - Analysis of Plates and Shells (3)
 CEGR 8127 - Fracture Mechanics and Fatigue (3)
 CEGR 8128 - Structural Optimization (3)
 CEGR 8151 - Research Methods (3)
 CEGR 8163 - GIS for Civil Engineers (3)
 CEGR 8222 - Experimental Structural Mechanics and Nondestructive Evaluation (3)
 CEGR 8892 - Individualized Study (3)
 MEGR 8141 - Theory of Elasticity I (3)

Transportation Engineering Concentration

Required Courses

CEGR 5161 - Advanced Traffic Engineering (3)
 CEGR 5162 - Transportation Planning (3)
 CEGR 5185 - Geometric Design of Highways (3)
 CEGR 8161 - Traffic Control and Operation (3)

Elective Courses

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
 (*Transportation Engineering topic*)
 CEGR 5171 - Urban Public Transportation (3)
 CEGR 5181 - Human Factors in Traffic Engineering (3)
 CEGR 5182 - Transportation Environmental Assessment (3)
 CEGR 5262 - Traffic Engineering (3)
 CEGR 5271 - Pavement Design (3)
 CEGR 8090 - Special Topics (3) (*Transportation Engineering topic*)
 CEGR 8151 - Research Methods (3)
 CEGR 8162 - Computer Applications for Transportation Engineers (3)
 CEGR 8163 - GIS for Civil Engineers (3)
 CEGR 8164 - Traffic Safety (3)
 CEGR 8166 - Urban Transportation Networks: Operations and Optimization (3)
 CEGR 8167 - Discrete Choice Modeling (3)
 CEGR 8181 - Traffic Flow Theory (3)
 CEGR 8182 - Transportation Systems Analysis (3)
 CEGR 8892 - Individualized Study (3)

Dissertation Research Course (18 credit hours)

The following course must be repeated for a total and maximum of 18 credit hours:

CEGR 8991 - Doctoral Dissertation (1 to 6)

Degree Total = 72 Credit Hours

sAdvising

Each student admitted to the doctoral program will be assigned an initial academic advisor. Within the first year (prior to completion of the second semester) in the doctoral program, each student selects a permanent doctoral research advisor. This selection must be approved by the Program Director and Dean of the Graduate School.

At any time, a doctoral student may request a change in initial academic advisor or doctoral research advisor. These requests must be submitted to the Program Director in writing for consideration and action.

Assistantships

Teaching assistantships are available from CEE on a competitive basis to highly qualified applicants. Interested applicants are encouraged to directly contact faculty in their area of interest for research assistantships.

Tuition Grants

Tuition grants including Non-Resident Tuition Differentials and Resident Tuition Aids are available on a competitive basis for both out-of-state and in-state doctoral students, respectively.

Doctoral Committee

Each student's doctoral committee will contain at least four members. One committee position will be filled by a UNC Charlotte Graduate Faculty Representative appointed by the Dean of the Graduate School. The remaining three members are recommended, before the completion of the student's first year in the doctoral program, by the student's doctoral research advisor, with input from the Graduate Program Director. The Program Director approves, with subsequent concurrence by the Dean of the Graduate School, the three recommended faculty members to serve on the doctoral committee. The doctoral committee of each student is chaired by the student's doctoral research advisor.

At least one doctoral committee member must be an expert and CEE faculty member in the student's area of concentration. The inclusion of one member from outside the area of concentration or CEE is strongly encouraged, and this person must also be a member of the UNC Charlotte Graduate Faculty.

Qualifying Examination

Each doctoral student with Advanced Standing must take and pass a qualifying exam before the end of the 4th semester from joining the doctoral program, while each doctoral student without a master's degree must take and pass a qualifying exam before the end of the 6th semester from joining the doctoral program. The written qualifying exam should cover at least four courses in the area of concentration, and is administered by the student's doctoral research advisor and doctoral committee. The written qualifying exam may be followed by an oral qualifying exam, administered by the student's doctoral research advisor and doctoral committee.

Doctoral students with Advanced Standing, who have completed at least 18 credit hours of coursework and have at least a 3.0 GPA, are eligible to take the written

qualifying exam. Doctoral students without a master's degree, who have completed at least 48 credit hours of coursework and have at least a 3.0 GPA, are also eligible to take the written qualifying exam. A doctoral student may attempt to pass the qualifying exam no more than twice. Failure to pass the written qualifying exam in two attempts or before the end of the specified semester will result in termination of enrollment in the doctoral program. Doctoral students who do not take the qualifying exam before the end of the specified semester but are terminated from the doctoral program may appeal to be reinstated back into the doctoral program by submitting an acceptable plan to take and pass the qualifying exam.

Advancement to Candidacy

After passing the qualifying examination, a student must propose a dissertation topic, prepare a written proposal, and submit it to the doctoral committee for review at least two weeks before the oral exam date. The oral exam, administered by the student's doctoral research advisor and doctoral committee, includes a presentation and defense by the student of his or her proposed research topic in a forum open to the public. This oral exam should be successfully completed before the end of the 5th semester from joining the doctoral program by doctoral students with Advanced Standing, and, before the end of the 8th semester from joining the doctoral program by doctoral students without a master's degree. The doctoral student advances to candidacy after the dissertation topic and proposal has been approved by the student's doctoral committee. The candidacy must be achieved at least 6 months before the doctoral degree is conferred.

Dissertation

The doctoral program includes a minimum of 18 credit hours of dissertation. Each doctoral student must complete and defend a dissertation based on a research program approved by the student's doctoral committee. The dissertation must be of high quality and represent an original piece of research that advances the body of knowledge in the area of concentration. The oral presentation and successful defense of the dissertation before the student's doctoral committee in a forum open to the public is required. A copy of the student's dissertation will be made available to the doctoral committee at least two weeks prior to the public defense. The dissertation must be written in a format acceptable to the Graduate School and shall satisfy all requirements and deadlines specified by the UNC Charlotte Graduate School. Details pertaining to required actions for the dissertation are available from the department and Graduate Program Director.

Dissertation

The doctoral program includes a minimum of 18 credit hours of dissertation. Each doctoral student must complete and defend a dissertation based on a research program

approved by the student's doctoral committee. The dissertation must be of high quality and represent an original piece of research that advances the body of knowledge in the area of concentration. The oral presentation and successful defense of the dissertation before the student's doctoral committee in a forum open to the public is required. A copy of the student's dissertation will be made available to the doctoral committee at least two weeks prior to the public defense. The dissertation must be written in a format acceptable to the Graduate School and shall satisfy all requirements and deadlines specified by the UNC Charlotte Graduate School. Details pertaining to required actions for the dissertation are available from the department and Graduate Program Director.

Application for Degree

Each student should apply for their doctoral degree by completing the online Application for Degree through DegreeWorks no later than the filing date specified in the UNC Charlotte Academic Calendar.

Time Limit

Students are allowed a maximum of eight (8) calendar years from formal admission to the doctoral program to complete the program successfully.

Transfer Credit

CEE accepts the transfer of related doctoral level courses (6 credit hours maximum) taken at another institution or from UNC Charlotte prior to admission to the doctoral program in Civil Engineering. These courses must be part of the recommended list of courses in the doctoral student's area of concentration. Further, these credit hours cannot be counted toward another degree.

Research Opportunity/Experience

CEE doctoral students enjoy a curriculum with opportunities for interdisciplinary research, study abroad, and active participation in a growing research program. Programs of study can be tailored to suit individual needs and interests. The CEE website provides current areas of research conducted by the faculty.

Assistantships

Teaching assistantships are available from CEE on a competitive basis to highly qualified applicants. Interested applicants are encouraged to directly contact faculty in their area of interest for research assistantships.

Research Opportunity/Experience

CEE doctoral students enjoy a curriculum with opportunities for interdisciplinary research, study abroad, and active participation in a growing research program. Programs of study can be tailored to suit individual needs

and interests. The CEE website provides current areas of research conducted by the faculty.

Tuition Grants

Tuition grants including Non-Resident Tuition Differentials and Resident Tuition Aids are available on a competitive basis for both out-of-state and in-state doctoral students, respectively.

M.S. in Civil Engineering (MSCE) or M.S. in Engineering (MSE)

The M.S.C.E. program requires a baccalaureate degree in Civil and Environmental Engineering. The M.S.E. degree offers a more discipline-specific program of study to students who may not possess a baccalaureate degree in Civil and Environmental Engineering.

The Department of Civil and Environmental Engineering offers graduate studies leading to a master's degree (M.S.C.E. or M.S.E.) in five areas of concentration:

- 1) Environmental and Water Resources Engineering
- 2) Geo-Environmental Engineering
- 3) Geotechnical Engineering
- 4) Structural Engineering
- 5) Transportation Engineering

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Department of Civil and Environmental Engineering seeks the following from applicants to the Master's programs in Civil Engineering:

- An earned undergraduate degree in Civil Engineering for the MSCE master's program or a closely related field for the MSE master's program
- An undergraduate GPA of 3.0 or higher
- A professional Curriculum Vitae (CV)
- Three letters of recommendation
- An acceptable English proficiency score as required by UNC Charlotte for international students
- And any other appropriate credentials as required by the Graduate School
- Remediation of certain deficiencies as specified by the department for each area of concentration

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog*

for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the *Graduate Catalog* for more information about Early Entry Programs.

Accelerated Master's Program

Academically talented high school seniors and UNC Charlotte undergraduate freshmen are encouraged to apply for the Accelerated Master's Program to begin work toward both undergraduate and graduate degrees in their Freshman year. See the Undergraduate Catalog for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the Graduate Catalog for more information about Accelerated Master's Programs.

Application Deadline

Applications for admission must be submitted online directly to the Graduate School. They may be submitted any time prior April 1 for Fall admission, and October 1 for Spring admission. To be considered for assistantships and tuition grants for the following academic year, students should apply by February 15 because the Department makes the first round of award decisions by March 15.

Degree Requirements

A minimum of 30 approved graduate credit hours is required for graduation. At least half of the approved graduate credit hours must be in courses numbered 6000 or above. A student may fulfill the 30-hour requirement by pursuing one of the three study options: (a) 24 hours of coursework plus 6 hours of thesis, (b) 27 hours of coursework plus 3 hours of a directed project, or (c) 30 hours of coursework and a comprehensive examination. Each student is limited to one individual study class within the 30 credit hour requirement.

Concentration Courses

Required core courses for the five concentrations are listed below.

Environmental and Water Resources Engineering Concentration

CEGR 5149 - Environmental Engineering Principles and Practices (3)
CEGR 5153 - Fundamentals of Environmental Microbiology (3)
CEGR 6151 - Research Methods in Civil and Environmental Engineering (3)
CEGR 6173 - Environmental Aquatic Chemistry (3)

Geo-Environmental Engineering Concentration

CEGR 5264 - Landfill Design and Site Remediation (3)

Geotechnical Engineering Concentration

CEGR 5270 - Earth Pressures and Retaining Structures (3)
CEGR 6251 - Foundation Engineering (3)

CEGR 6254 - Experimental Soil Mechanics (3)
CEGR 6255 - Slope Stability and Earth Structures (3)
CEGR 6268 - Advanced Soil Mechanics (3) -

Structural Engineering Concentration

CEGR 5108 - Finite Element Analysis and Applications (3)
CEGR 5222 - Structural Steel Design II (3)
CEGR 5224 - Advanced Structural Analysis (3)
CEGR 5226 - Reinforced Concrete Design II (3)
CEGR 6129 - Structural Dynamics (3)

Transportation Engineering Concentration

CEGR 5161 - Advanced Traffic Engineering (3)
CEGR 5162 - Transportation Planning (3)
CEGR 5185 - Geometric Design of Highways (3)
CEGR 6161 - Traffic Control and Operation (3)
GEOG 6100 - Quantitative Methods in Geography (3)

Additional Recommended Courses

Additional recommended courses (excluding CEGR 6891, CEGR 6892, and CEGR 6991) for each concentration are listed below.

Environmental and Water Resources Engineering Concentration

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
(environmental and water resources engineering topic)
CEGR 5142 - Water Treatment Engineering (3)
CEGR 5144 - Engineering Hydrology (3)
CEGR 5145 - Groundwater Resources Engineering (3)
CEGR 5146 - Advanced Engineering Hydraulics (3)
CEGR 5147 - Stormwater Management (3)
CEGR 5242 - Wastewater Treatment Plant Design (3)
CEGR 5247 - Sustainability (3)
CEGR 6090 - Special Topics in Civil Engineering (1 to 6)
(environmental and water resources engineering topic)
CEGR 6141 - Water Quality Modeling (3)
CEGR 6144 - Environmental Biotechnology (3)
CEGR 6173 - Environmental Aquatic Chemistry (3)
CEGR 6244 - Chemical Fate and Transport (3)

Geo-Environmental Engineering Concentration

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
(geo-environmental engineering topic)
CEGR 5270 - Earth Pressures and Retaining Structures (3)
CEGR 5271 - Pavement Design (3)
CEGR 5272 - Design with Geosynthetics (3)
CEGR 5273 - Engineering Ground Improvement (3)
CEGR 5278 - Geotechnical Engineering II (3)
CEGR 6244 - Chemical Fate and Transport (3)
CEGR 6251 - Foundation Engineering (3)
CEGR 6252 - Soil Dynamics and Earthquake Engineering (3)
CEGR 6254 - Experimental Soil Mechanics (3)
CEGR 6255 - Slope Stability and Earth Structures (3)
CEGR 6268 - Advanced Soil Mechanics (3)

Geotechnical Engineering Concentration

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
(geotechnical engineering topic)
 CEGR 5145 - Groundwater Resources Engineering (3)
 CEGR 5264 - Landfill Design and Site Remediation (3)
 CEGR 5271 - Pavement Design (3)
 CEGR 5272 - Design with Geosynthetics (3)
 CEGR 5273 - Engineering Ground Improvement (3)
 CEGR 5278 - Geotechnical Engineering II (3)
 CEGR 6252 - Soil Dynamics and Earthquake Engineering (3)

Structural Engineering Concentration

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
(structural engineering topic)
 CEGR 5125 - Forensic Engineering (3)
 CEGR 5126 - Codes, Loads, and Nodes (3)
 CEGR 5128 - Matrix Methods of Structural Analysis (3)
 CEGR 5223 - Timber Design (3)
 CEGR 6090 - Special Topics in Civil Engineering (1 to 6)
(structural engineering topic)
 CEGR 6122 - Advanced Topics in Structural Steel (3)
 CEGR 6124 - Masonry Design (3)
 CEGR 6125 - Structural Strengthening (3)
 CEGR 6126 - Analysis of Plates and Shells (3)
 CEGR 6127 - Fracture Mechanics and Fatigue (3)
 CEGR 6128 - Structural Optimization (3)
 CEGR 6222 - Experimental Structural Mechanics and
 Nondestructive Evaluation (3)
 CEGR 6222 - Experimental Structural Mechanics and
 Nondestructive Evaluation (3)
 CEGR 6223 - Introduction to Structures in Fire (3)
 CEGR 6224 - Introduction to Power Transmission Structure
 Designs (3)
 CEGR 6225 - Forensic Investigations (3)
 CEGR 6226 - Structural Systems (3)
 MEGR 6141 - Theory of Elasticity I (3)

Transportation Engineering Concentration

CEGR 5090 - Special Topics in Civil Engineering (1 to 4)
(transportation engineering topic)
 CEGR 5171 - Urban Public Transportation (3)
 CEGR 5181 - Human Factors in Traffic Engineering (3)
 CEGR 5182 - Transportation Environmental Assessment (3)
 CEGR 5262 - Traffic Engineering (3)
 CEGR 5271 - Pavement Design (3)
 CEGR 6090 - Special Topics in Civil Engineering (1 to 6)
(transportation engineering topic)
 CEGR 6162 - Computer Applications for Transportation
 Engineers (3)
 CEGR 6163 - GIS for Civil Engineers (3)
 CEGR 6164 - Traffic Safety (3)
 CEGR 6165 - Urban Systems Engineering (3)
 CEGR 6166 - Urban Transportation Networks: Operations
 and Optimization (3)
 CEGR 6167 - Discrete Choice Modeling (3)
 CEGR 6181 - Traffic Flow Theory (3)
 CEGR 6182 - Transportation Systems Analysis (3)

Note: Undergraduate students who have taken any of the courses listed above, or equivalent material, as part of their undergraduate program need not take the corresponding 5000-level graduate courses. Instead, they may choose other graduate courses as part of their master's degree plan of study. Courses without designated course numbers are currently being offered as Special Topic classes with appropriate course numbers yet to be provided.

Elective Courses

With advisor and Graduate Program Director approval, a maximum of one graduate course (outside or within CEGR) related to the thesis topic, project topic, or student's concentration may be incorporated into the 30 credit hour requirement. A student with a non-CEGR background is encouraged to fulfill the 30 credit hour requirement by taking all CEGR courses.

Transfer Credit

The Department accepts the transfer of related graduate courses (6 credit hours maximum) taken at another institution or from UNC Charlotte prior to admission to the master's program in Civil Engineering.

Capstone Experiences

Students pursuing a master's degree in Civil and Environmental Engineering have three options to complete the 30-credit-hour program:

- 1) 24 credit hours of coursework plus 6 credit hours of thesis (CEGR 6991)
- 2) 27 credit hours of coursework plus 3 credit hours of a directed project (CEGR 6891)
- 3) 30 credit hours of coursework plus a written and/or oral comprehensive examination*

** Please note, only the Structural and Transportation concentrations currently offer a Comprehensive Exam option. All other concentrations will complete either a thesis or a project.*

All three options require the formation of a program committee as described below. The thesis and project options require students to submit a written thesis or project report, and orally defend their work before their program committee.

Structural and Transportation students: The comprehensive exam may be taken once all core courses are completed, and at least 18 credit hours of graduate coursework are either completed or in progress. Core courses taken at the graduate level may be included in the 18 credit hours. Exception requests may be considered if a student has completed all but one of the core courses and is currently enrolled in the final core course of their plan of study. The

student's graduate advisor and the examining committee coordinate the examination (typically offered once in the Fall semester, once in the Spring semester, and once in the Summer), preparing the exam with the assistance of members of the student's Program Committee. The exam measures the student's mastery of theories and applications in core courses and/or in the selected area of specialization within the discipline. Students have only two attempts to pass the examination. All students passing the written examination are assessed further on their oral communication effectiveness.

Degree Total = 30 Credit Hours

Application for Degree

Students preparing to graduate must submit an online Application for Degree by the filing date specified in the University Academic Calendar. If a student does not graduate in the semester identified on the Application for Degree, then the student must submit a new Application for Degree for graduation in a subsequent semester.

Advising

Each student is assigned an initial academic advisor. Upon developing a program of study, the student shall be supervised by their graduate advisor and a program committee.

Program Committee

The Program Committee shall consist of at least three UNC Charlotte graduate faculty members. At most one graduate faculty member (CEGR or non-CEGR) from outside the student's concentration may serve as a member of the Program Committee. The student's CEE graduate advisor shall chair the committee.

Research Opportunity/Experience

Students in Civil and Environmental Engineering enjoy a curriculum with opportunities for interdisciplinary research, study abroad, and active participation in a growing research program. Programs of study can be tailored to suit individual needs and interests. The CEE website (cee.charlotte.edu) provides current areas of research conducted by the Civil and Environmental Engineering faculty.

Program Learning Outcomes

Students completing master's degree will demonstrate abilities to analyze and evaluate advanced topics in engineering, and to communicate technical information effectively. Achievement of these outcomes will prepare students to function professionally in their chosen careers.

Program learning outcomes for doctoral students are described in the "Infrastructure and Environmental Systems" section of this *Catalog*.

Assistantships

Research and teaching assistantships are available from the Department on a competitive basis to highly qualified applicants/students. Interested students are encouraged to directly contact faculty in their area of interest for research assistantships.

Tuition Grants

Tuition grants including Non-Resident Tuition Differentials and Resident Tuition Aids are available on a competitive basis for both out-of-state and in-state students, respectively.

CONSTRUCTION AND FACILITIES ENGINEERING

• M.S. in Construction and Facilities Engineering

Department of Engineering Technology and Construction Management
et.charlotte.edu

M.S. in Construction and Facilities Engineering

Construction Engineering is a program that prepares individuals to manage, coordinate, and supervise the construction process from concept development through project completion on timely and economic bases. Such programs include instruction in commercial, residential, mechanical, highway/heavy civil, electrical, environmental, industrial, and specialty construction; facilities management; project planning; budgeting and cost control; logistics and materials management; personnel management and labor relations; site safety; construction contracting; construction processes and techniques; organization and scheduling; and applicable codes and regulations.

Facility Engineering is a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology. The body of knowledge required for facility engineering degree programs includes facility function (professional practice), human and environmental factors, planning and project management, finance, operation and maintenance, real estate, written and oral communication, information technology, quality management and assessment procedures (research and analytical methods), and integrative and problem-solving skills.

Construction and facility engineering professionals work with owners, engineers, architects, specialty and sub-contractors, government agencies, and others to deliver, operate and maintain constructed projects and facilities. This M.S. program provides the advanced professional development and graduate education necessary for construction and facility engineering professionals to work in the increasing high tech, rapidly changing construction industry and related careers such as real estate and land development, infrastructure development, code

enforcement, and insurance. The program also has a special relationship with and focus on sustainability and energy infrastructure as part of the Energy Production and Infrastructure Center (EPIC) and Innovative Design, Engineering, and Sustainability (IDEAS) Center initiatives at UNC Charlotte.

Admission Requirements

The minimum admission requirements for the program are:

- An earned undergraduate degree in construction management, facility management, engineering technology, engineering, architecture, or a closely related field
- An undergraduate GPA of 2.75 or above
- Acceptable scores on the verbal, quantitative, and analytical sections of the GRE
- Positive recommendations
- A combined TOEFL score of 220 (computer-based) or 557 (paper-based) is required if the previous degree was from a country where English is not the common language
- Integral and differential calculus (MATH 1120, MATH 1121, or ETGR 3171 or equivalent)
- Statistics (STAT 1220 or STAT 3128 or equivalent)
- Other credentials as required by the Graduate School

Documents to be Submitted

- Official transcripts from all colleges and universities attended
- Official GRE scores
- Official TOEFL scores
- The UNC Charlotte application for graduate admission online
- Three professional recommendations
- Others as required by the Graduate School

GRE Waiver

The GRE requirement will be waived for the following applicants:

- UNC Charlotte students currently enrolled in engineering technology, construction management, engineering, or architecture
- Applicants having earned a bachelor's degree in engineering or engineering technology from an ABET-accredited program; or a bachelor's degree in construction management, construction science, building construction, or building science from an ACCE accredited program; or a bachelor's degree in architecture from an NCARB accredited program
- Applicants having an earned graduate degree

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog*

for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the *Graduate Catalog* for more information about Early Entry Programs.

Application Deadline

Applications can be received by the Graduate Admission Office any time prior to the published deadlines. In order to be considered for assistantships and tuition grants for the following academic year, students should apply by March 1 for priority consideration. The first round of award decisions typically occurs by March 15. However, the Department will evaluate admission applications at any time complete applications are received by the Graduate School.

Degree Requirements

The program leading to the Master of Science degree in Construction and Facilities Engineering is a 30 credit hour program. The program consists of a 9 credit hour common core and a capstone experience, including either a non-research-focused sequence of 21 credit hours of electives or a research-focused sequence of 15 credit hours of electives with a formal 6 credit hour graduate research thesis and completion of the 3 credit hour CMET 6160 course. At least 15 credit hours must be in courses numbered 6000 or above. The 30 credit hour degree program is outlined below:

Common Core Courses (9 credit hours)

CMET 6135 - Advanced Construction Planning and Management (3)
CMET 6240 - Safety and Risk Management (3)
CMET 6270 - Operation of Constructed Facilities (3)

Elective Courses (21 credit hours)

Select from one of the following sequences:

Master's Thesis and Research Sequence (21 credit hours)

Required Courses (9 credit hours)

CMET 6160 - Research and Analytics Methods (3)
CMET 6900 - Master's Thesis and Research (6)

Elective Courses (12 credit hours)

Select from the following or others with director approval:

AECE 5250 - Analysis of Renewable Energy Systems (3)
AECE 5275 - Building Environmental Systems (3)
AECE 5285 - Applied Noise and Vibration Control (3)
AECE 5290 - Advanced Instrumentation (3)
AECE 5295 - High Voltage Technology (3)
AECE 6120 - Energy Generation and Conversion (3)
AECE 6135 - Energy Transmission and Distribution (3)
AECE 6150 - System Dynamics (3)
AECE 6170 - Applied Mechatronics (3)
CMET 5126 - Project Scheduling and Control (3)
CMET 5135 - Building Information Modeling (3)
CMET 5140 - Building Energy Management (3)

CMET 5150 - Green Building (3)
CMET 5160 - Advanced Construction Materials (3)
CMET 5290 - Temporary Structures in Construction (3)
CMET 6000 - Special Topics in Construction and Facility Management (3)
CMET 6145 - Facilities Management Financial Analysis (3)
CMET 6160 - Research and Analytical Methods (3)
CMET 6165 - Transportation Asset Management (3)
CMET 6180 - Alternative Project Delivery Methods (3)
CMET 6250 - Asset Management for Facility Managers (3)
CMET 6255 - Advanced Plant Layout and Design (3)
CMET 6275 - Advanced Construction Means and Methods (3)
CMET 6285 - Quality Assurance in Construction (3)
CMET 6800 - Independent Study in Construction and Facility Management (3)
ETGR 5272 - Engineering Analysis IV (3)

Coursework Sequence (21 credit hours)

Elective Courses (21 credit hours)

Select from the following or others with director approval:

AECE 5250 - Analysis of Renewable Energy Systems (3)
AECE 5275 - Building Environmental Systems (3)
AECE 5285 - Applied Noise and Vibration Control (3)
AECE 5290 - Advanced Instrumentation (3)
AECE 5295 - High Voltage Technology (3)
AECE 6120 - Energy Generation and Conversion (3)
AECE 6135 - Energy Transmission and Distribution (3)
AECE 6150 - System Dynamics (3)
AECE 6170 - Applied Mechatronics (3)
CMET 5126 - Project Scheduling and Control (3)
CMET 5135 - Building Information Modeling (3)
CMET 5140 - Building Energy Management (3)
CMET 5150 - Green Building (3)
CMET 5160 - Advanced Construction Materials (3)
CMET 5290 - Temporary Structures in Construction (3)
CMET 6000 - Special Topics in Construction and Facility Management (3)
CMET 6145 - Facilities Management Financial Analysis (3)
CMET 6160 - Research and Analytical Methods (3)
CMET 6165 - Transportation Asset Management (3)
CMET 6180 - Alternative Project Delivery Methods (3)
CMET 6250 - Asset Management for Facility Managers (3)
CMET 6255 - Advanced Plant Layout and Design (3)
CMET 6275 - Advanced Construction Means and Methods (3)
CMET 6285 - Quality Assurance in Construction (3)
CMET 6800 - Independent Study in Construction and Facility Management (3)
ETGR 5272 - Engineering Analysis IV (3)

Note: Additional new major elective courses may be created based on industry needs and faculty research interest. In addition, appropriate existing graduate level courses from other programs may be approved by the Graduate Program Director.

Capstone Experiences

Students pursuing the M.S. in Construction and Facilities Engineering have two options to complete the 30 credit hour program:

- 1) 24 credit hours of coursework plus 6 credit hours of thesis project
- 2) 30 credit hours of coursework and a comprehensive examination

Both options require the formation of a program committee. The thesis option is reserved for students who are attending the on-campus program and are performing research under formal graduate research or teaching assistantships. Students receiving such assistantships may be required to pursue the thesis option. The thesis option requires students to submit a written thesis and orally defend their work before their program committee.

All non-thesis students must complete 30 credit hours of coursework and successfully complete a formal comprehensive examination. The comprehensive examination is a written exam. A student's exam will be scheduled when they have at least 24 hours of course credit completed or in progress. The student's graduate advisor and the examining committee will coordinate the examination (to be offered once in the Fall and once in the Spring semesters), preparing the exam with the assistance of members of the student's program committee. The exam will measure the student's mastery of theories and applications in the selected area of specialization within the discipline. Students will have only two opportunities to receive passing marks on the examination.

Other Requirements

The program has both a thesis and non-thesis track. After admission to candidacy, thesis students will complete a comprehensive oral exam while non-thesis students will complete a comprehensive written exam. Residence will be per Graduate School rules. There is no language requirement. While full-time students will typically take three semesters to complete the program, part-time students are expected to take no more than seven years to complete the program, as per Graduate School rules.

Degree Total = 30 Credit Hours**Grade Requirements**

All candidates must earn an overall 3.0 GPA to graduate. Accumulation of one U grade or three C grades will result in the suspension of the student's enrollment in the program.

Advising

Each student is supervised by their graduate advisor and a program committee.

Application for Degree

Each student should submit an Application for Degree prior to graduation. If a student does not graduate in the semester identified on the Application, the student must complete a new form and repay the application fee to be considered for graduation in a subsequent semester.

Program Committee

The Program Committee shall consist of at least three graduate faculty members. A graduate faculty from outside the Department of Engineering Technology and Construction Management or from outside the student's major area-of-study may serve as a member of the Program Committee. The student's CMET graduate advisor shall chair the committee.

Transfer Credit

The department, at its discretion, may accept transfer of graduate courses (6 credit hours maximum) taken at another institution or from another program prior to admission to the M.S. in Construction and Facilities Engineering program. Only courses in which the student earned a grade of B or above may be transferred.

Assistantships

Research and teaching assistantships are available from the department on a competitive basis to highly qualified applicants/students.

Tuition Grants

Tuition grants, including out-of-state tuition differential waivers and in-state tuition support, are available on a competitive basis for both out-of-state and in-state students, respectively.

ELECTRICAL AND COMPUTER ENGINEERING

- Ph.D. in Electrical Engineering
- M.S. in Computer Engineering (MSCPE)
- M.S. in Electrical Engineering (MSEE)
 - o Power and Energy Systems

Department of Electrical and Computer Engineering
ece.charlotte.edu

Ph.D. in Electrical Engineering

The Ph.D. program provides students with research-level expertise in a focus area within electrical and computer engineering and breadth of knowledge in areas related to the focus area. In addition to taking a set of courses in a chosen area of concentration, a key aspect of the doctoral degree is the student's research dissertation. Each dissertation is expected to be a significant original contribution on research on a chosen subject, leading to one or more archival publications. Successful doctoral candidates learn how to acquire advanced knowledge from published research articles, identify research problems, formulate plausible approaches to solve them, analyze and evaluate proposed solutions, and present technical material orally and in writing. The program prepares graduates for contributing to the generation of new knowledge and results in the field.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Department of Electrical and Computer Engineering seeks the following from applicants to the Ph.D. in Electrical Engineering program:

- 1) A master's degree in electrical and/or computer engineering or a closely allied field, demonstrating strong academic background for performing research in a chosen area of interest (*Exceptional students with only a baccalaureate degree who are motivated to pursue a Ph.D. may also be considered for direct admission to the Ph.D. program*)
- 2) Satisfactory scores on the quantitative and verbal sections of the Graduate Record Examinations (GRE) general test*

- 3) A statement of purpose, written by the applicant, that specifies the applicant's research interests within Electrical and Computer Engineering

**The GRE requirement will be waived for:*

- Applicants who have an undergraduate degree from an ABET-accredited U.S. institution and have at least three years post-graduation experience in the related field
- Recent UNC Charlotte undergraduates with a minimum GPA of 3.25
- Currently enrolled UNC Charlotte undergraduate students eligible for the MSEE Early Entry Program with a minimum GPA of 3.25

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The following is a chronologically ordered set of requirements for the Ph.D. degree in Electrical Engineering:

- 1) Appointment of a Ph.D. advisor and formation of an advisory committee
- 2) Development of a Ph.D. Plan of Study detailing all course and examination requirements
- 3) Successful completion of the qualifying examinations
- 4) Presentation of a proposal for Ph.D. research and admission to candidacy
- 5) Successful defense of the Ph.D. Dissertation

Within the first semester of being admitted into a Ph.D. program, the student should choose a Ph.D. advisor and form an advisory committee. In conjunction with the Ph.D. advisor and this advisory committee, the student will develop a Plan of Study to meet the Ph.D. program requirements of coursework and examinations and prepare to undertake original research leading to a doctoral dissertation. Normally, a student would be expected to have at least one archival publication on the research performed for the dissertation.

Plan of Study

The Plan of Study must be submitted to the Director of Graduate Programs for review and approval within the second semester of enrollment in the Ph.D. program. The Plan of Study must show a minimum of 72 credit hours beyond the baccalaureate degree, including 18 credit hours of doctoral dissertation and 54 credit hours of coursework. Additional doctoral dissertation credit hours

may be applied as coursework with the approval of the Graduate Program Director.

The specific course requirements will be set by the student's Advisory Committee. Doctoral students should take 8000-level courses when they are available. 6000- and 5000-level graduate courses that do not have 8000-level counterparts may also be counted towards the doctoral degree if approved by the Advisory Committee. For students who do not possess bachelor's and/or master's degrees in appropriate fields of study, additional coursework may be required. Courses taken without the approval of the advisory committee may not be counted toward the degree.

Advisory Committee

The Advisory Committee is composed of at least four graduate faculty members, the majority of whom must be faculty of the Department of Electrical and Computer Engineering. One of these four members shall be appointed as the Graduate Faculty Representative by the Graduate School. The Ph.D. advisor serves as chair of the committee and must be a member of the Department of Electrical and Computer Engineering graduate faculty. Committee members from outside the University must be appointed Associate Graduate Faculty members at UNC Charlotte. The Advisory Committee must be approved by the Associate Chair for Graduate Programs.

Degree Total = 72 Credit Hours

Grade Requirements

A student must have a GPA of at least a 3.0 in order to graduate. The dissertation is graded on a Pass/Unsatisfactory basis and, therefore, will not be included in the cumulative GPA. An accumulation of more than two marginal (C) grades will result in suspension of the student's enrollment in the graduate program. If a student makes a grade of U on any course, enrollment will be suspended. A graduate student whose enrollment has been suspended because of grades is ineligible to attend any semester or summer session unless properly readmitted to the graduate program. Readmission to the program requires approval of the Dean of the Graduate School upon the recommendation of the student's major department.

Residence

A student may satisfy the residency requirement for the program by completing 18 hours, either coursework or research credits, by study-in-residence during the academic year and during the summer terms, as long as the study is continuous. Study-in-residence is deemed to be continuous if the student is enrolled in one or more courses (including research/dissertation credit) in

successive semesters until eighteen hours of credit are earned.

Qualifying Examination

In addition to demonstrating a high level of competence in coursework, the student must pass the Ph.D. qualifying examinations. The qualifying examination should be taken before completion of 24 hours beyond the master's degree but must be passed no later than four semesters after initial enrollment in the program. Failure to pass the qualifying examination after two attempts will result in the termination of the student's enrollment in the Ph.D. program.

The qualifying examination is divided into two test sessions. The first session comprises of a written examination on the breadth areas of electrical and computer engineering, and the second session is a research aptitude test that comprises of a technical presentation. For a detailed description of the procedures for the Ph.D. qualifying examinations in electrical and computer engineering please contact the ECE department or visit ece.charlotte.edu.

Dissertation Proposal and Admission to Candidacy

Because the Ph.D. program is heavily based on independent research, each student must write a proposal describing their proposed dissertation research following the technical guidelines established by the department. The proposal must be presented to and orally defended before the student's advisory committee. The proposal must be presented within one year after the qualifying examination is passed. Upon approval of the student's dissertation proposal, the advisory committee will recommend the student's admission to candidacy subject to the approval of the Engineering Doctoral Graduate Committee and the Dean of the Graduate School.

Dissertation

Evidence of a high degree of competence in scholarship, written exposition, independent inquiry and the ability to organize and apply knowledge must be demonstrated by the student in the dissertation. The student will make a public defense of the dissertation at which time the dissertation, as well as the student's knowledge of the field, will be appropriate matter for examination by the student's advisory committee. Although questions may be asked by the general audience, evaluation of the dissertation defense is the sole responsibility of the advisory committee. The dissertation will be graded on a Pass/Unsatisfactory basis.

Application for Degree

Students preparing to graduate must submit an online Application for Degree by the filing date specified in the

University Academic Calendar. If a student does not graduate in the semester identified on the Application for Degree, then the student must update their Admission to Candidacy and submit a new Application for Degree for graduation in a subsequent semester.

Time Limit

Students are allowed a maximum of nine calendar years from formal admission to the Ph.D. program to complete the program successfully.

Assistantships

There are two forms of assistantships that are offered by the ECE Department. These are Teaching Assistantships (TAs) and Research Assistantships (RAs). RAs are controlled by faculty members with research grants, and the faculty members make the decisions in selecting students for RAs. Therefore, for RAs, students should contact individual faculty members directly. TAs are given to students to help faculty members with classroom teaching or laboratory instruction and these allocations are related to the ECE department needs and available resources. In all cases, the TAs and RAs are awarded to exceptional students. Application forms are available online at ece.charlotte.edu.

Tuition Waivers

For exceptionally qualified candidates who are awarded TAs or RAs, a limited number of tuition awards are available on a competitive basis.

Advanced Standing Option

Students who hold a master's degree in electrical engineering, computer engineering, or a closely related field, may opt for the Advanced Standing Option for the Ph. D. in Electrical Engineering program.

Admission Requirements

In order to be admitted into the Advanced Standing Option for the Ph.D. in Electrical Engineering program, students must meet all the admission requirements of the Ph.D. program above AND must have earned a master's degree in electrical engineering, computer engineering, or closely related fields. All other students should apply to the Ph.D. program above (without the Advanced Standing Option). Eligibility for this accelerated option is subject to review by the Graduate School.

Degree Requirements

The degree requirements for the Advanced Standing Option are similar to the requirements for the Ph.D. in Electrical Engineering program above except that the total required number of credit hours is reduced to 42.

The required minimum of 42 credit hours under the Advanced Standing Option should include 18 credit hours of doctoral dissertation credits and 24 credit hours of coursework. Additional doctoral dissertation credits may be applied as coursework with the approval of the Graduate Program Director.

No transfer credits are allowed under this accelerated option.

Degree Total = 42 Credit Hours

M.S. in Computer Engineering (MSCPE)

The M.S. in Computer Engineering (MSCPE) program is designed to impart advanced knowledge on current and future generation computer hardware and software technologies. The program is structured to emphasize the broad areas of Computer Architecture and Hardware Design; Computer Systems and Applications Software; and Distributed and Real-time Computer Systems. In addition to taking graduate-level courses in one or more areas of concentration within the department, students in the MSCPE program have the opportunity to engage in research and individualized projects.

Active research areas in computer engineering include: embedded systems, robotics, computer architecture, hardware/software co-design, real-time systems, reconfigurable and high performance computing, VLSI design, Big Data, mobile and edge computing, computer networks, Internet of Things, cyber-physical systems, digital signal and image processing, deep learning and machine learning algorithms, computer vision, hardware security, low-power electronics, operation and control of the Smart Grid, and others. A full range of state-of-the-art laboratories is available, enabling faculty and students to conduct research at the cutting edge of technology.

Admission Requirements

In addition to the established Graduate School admissions criteria, the Department of Electrical and Computer Engineering seeks the following from applicants to the Master's program in Computer Engineering (MSCPE):

- An earned undergraduate degree in Electrical and Computer Engineering or a closely related field of engineering or sciences
 - Applicants with baccalaureate degrees in fields other than Electrical and Computer Engineering (e.g. physics, mathematics, computer science, etc.) may be considered for admission, if satisfactory evidence on the aptitude to pursue graduate studies in Electrical and Computer Engineering is

demonstrated. If additional preparatory courses are required, such courses should be taken before applying for the MSCPE.

- A proven track record with a minimum undergraduate GPA of 3.0 on a 4.0 scale
- Additional academic credentials, such as other attempted post-baccalaureate studies undertaken, if applicable, may also be submitted
- Satisfactory scores in the quantitative and verbal sections of the Graduate Record Examinations (GRE) general test
- For international applicants from non-English speaking countries, a minimum Test of English as a Foreign Language (TOEFL) score of 220 (computer-based), 557 (paper-based), or 83 (internet-based) must be obtained. Other official English proficiency tests such as MELAB and IELTS may also be acceptable, as stated in the Graduate School's admissions section.
- Admission is based on the overall background, motivation, and potential, as determined by the department

GRE Waiver

The GRE requirement will be waived for:

- Applicants who have an undergraduate degree from an ABET-accredited U.S. institution and have at least three years post-graduation experience in the related field
- Recent UNC Charlotte undergraduate graduates with a minimum GPA of 3.25

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The MSCPE program requires successful completion of 30 graduate credit hours as approved by the student's graduate advisor. At least 24 credit hours applied to the MSCPE degree must be from the Department of Electrical and Computer Engineering. This can be done using one of three options:

- 1) **Thesis option** - 9 credit hours of thesis and 21 credit hours of coursework
- 2) **Project option** - 3 credit hours of individual study and projects and 27 credit hours of coursework
- 3) **Comprehensive Examination option** - 30 credit hours of coursework and a comprehensive written examination

Core Courses (9 credit hours)

All options require students to complete the following:

- ECGR 5101 - Advanced Embedded Systems (3)
- ECGR 5181 - Computer Architecture (3)
- ECGR 5187 - Data Communications and Networking II (3)

Elective Courses

Select from the following elective courses to complete the degree requirements. Courses not included in this list, including new and special topics courses on computer engineering, may be eligible with approval from the student's graduate advisor. Also, online courses offered through the NCSU Engineering Online program would be eligible.

Note(s):

- A maximum of 6 credit hours of transfer credit, including courses taken through NCSU Engineering Online, are permitted.)
- Students pursuing an optional concentration will replace 12 credits of electives with the concentration requirements.

- ECGR 5090 - Special Topics (1 to 6)
- ECGR 5100 - Research Tools and Techniques in Computer Engineering (3)
- ECGR 5103 - Applied Computer Graphics (3)
- ECGR 5124 - Digital Signal Processing (3)
- ECGR 5133 - VLSI Systems Design (3)
- ECGR 5134 - Advanced VLSI Systems Design (3)
- ECGR 5146 - Introduction to VHDL (3)
- ECGR 5196 - Introduction To Robotics (3)
- ECGR 6090 - Special Topics (1 to 6)
- ECGR 6114 - Digital Signal Processing II (3)
- ECGR 6118 - Applied Digital Image Processing (3)
- ECGR 6119 - Applied Artificial Intelligence (3)
- ECGR 6120 - Wireless Communication and Networking (3)
- ECGR 6146 - Advanced VHDL (3)
- ECGR 6181 - Embedded Operating Systems (3)
- ECGR 6182 - Advanced Embedded Operating Systems (3)
- ECGR 6185 - Embedded Commercial Product Design (3)
- ECGR 6188 - Fundamentals of Wireless Systems and Protocols (3)
- ECGR 6189 - Wireless Sensor Networks (3)
- ITCS 6114 - Algorithms and Data Structures (3)
- ITCS 6151 - Intelligent Robotics (3)
- ITCS 6152 - Robot Motion Planning (3)

MSCPE Options

All students enrolled in MSCPE must meet the Graduate School's general requirements for a master's degree at UNC Charlotte. Students must meet with their advisor to formulate a plan of study and get the committee's approval. The plan of study must be submitted after completing at least 9 but no more than 18 credit hours. In

addition, students should note the following requirements based on their selected option:

Thesis Option

Students opting for the thesis option must take 9 credit hours of ECGR 6991 and 21 credit hours of coursework. A committee of three graduate faculty members must approve the final written thesis and oral defense.

ECGR 6991 - Graduate Master Thesis Research (6)

Non-Thesis Project Option

Students opting for the non-thesis project option must take 3 credit hours of ECGR 6890 and 27 credit hours of coursework. A committee of three graduate faculty members must approve the final oral defense and a written project report.

ECGR 6890 - Individualized Study and Projects (1 to 6)

Non-Thesis Comprehensive Examination Option

Students who elect the non-thesis comprehensive examination option must complete 30 credit hours of approved coursework and pass the written comprehensive examination that is administered by the department. Students have two chances to successfully pass the comprehensive examination.

Optional Concentration in Artificial Intelligence and Machine Learning (AI and ML)

The Department of Electrical and Computer Engineering offers a Concentration in Artificial Intelligence and Machine Learning (AI and ML) for the MSCPE program. The concentration requires taking one core course and three courses from a list of approved electives. The Concentration in AI and ML empowers students to design intelligent and autonomous systems across various domains. It emphasizes the application of machine learning and data mining to solve real-world challenges and integrates intelligent behavior into computing platforms.

Machine Learning, a pivotal domain influencing numerous industries, is a key focus of this concentration. Students will acquire the expertise to choose, modify, optimize, or create machine learning algorithms tailored for specific applications. They will also learn to evaluate their efficacy, familiarize themselves with related software and hardware tools, manage and visualize diverse data sets, and interpret methods from the machine learning literature. With the knowledge from the Concentration in AI and ML, students are positioned for success in fields like data mining, robotics, natural language processing, and computer vision.

This concentration delves into topics such as computer vision, natural language processing, robotics, deep learning, and knowledge acquisition. Courses emphasize real-world

machine learning applications in engineering systems, offering students a deeper understanding of practical machine learning deployment. Specific focus areas include anomaly detection, defect detection, predictive maintenance, intelligent scheduling, and resource allocation. Additionally, the concentration highlights the application of machine learning and advanced language models to real-world engineering tasks like reasoning, design, validation, and testing. Emerging trends in machine learning, such as generative AI and large pre-trained transformers, which promise to revolutionize future engineering systems, are also covered. The curriculum ranges from foundational subjects to more advanced, application-centric topics within broader engineering systems.

The concentration is reflected in the student's transcript upon successful completion of the MSCPE program. Students interested in earning their MSCPE degree with the concentration must indicate their interest in this option in their Plan of Study which must be submitted within their second semester into the master's program. The MSCPE degree can also be earned without specifying a concentration, where the student has greater flexibility in selecting their courses.

In order to earn a MSCPE degree with a Concentration in AI and ML, a student must take:

Core Course

ECGR 5105 - Introduction to Machine Learning (3)

Any 3 elective courses from the approved list below, with at least one at the 6000 level:

ECGR 5103 - Machine Vision, AI and Image Processing (3)

ECGR 5106 - Real-Time Machine Learning (3)

ECGR 5115 - Convex Optimization and AI Applications

ECGR 5116 - Artificial Intelligence for Biomedical Applications (3)

ECGR 5117 - AI for Robotics and Automation (3)

ECGR 5127 - Machine Learning for the Internet of Things (3)

ECGR 6116 - Foundations of Reinforcement Learning and Optimal Control (3)

ECGR 6119 - Applied Artificial Intelligence (3)

ECGR 6126 - Optimization for Machine Learning (3)

In addition to the requirements above, students seeking a graduate concentration must also complete the general requirements for the MSCPE degree for their chosen option (thesis, project, or course-only exam option). It is noted that the concentration courses may be used to fulfill the MSCPE degree requirements.

Degree Total = 30 Credit Hours

Grade Requirements

A graduate student must have a minimum grade point average (GPA) of 3.0 on the plan of study. Courses graded as C must be offset by an equal number of graduate level credits graded as A.

M.S. in Electrical Engineering (MSEE)

The M.S. in Electrical Engineering (MSEE) program provides students with advanced knowledge on the theory and applications of electrical systems and signal processing. The program spans across the broad areas of communications, controls, and signal processing; electronic and electromagnetic devices; and power and energy systems. In addition to taking a set of courses in a chosen area of focus, students in the MSEE program achieve breadth of knowledge in related areas and have the opportunity to engage in individualized projects or research.

Active areas of research include wireless networking, information theory, image processing, computer vision, robotics and dynamical systems, metamaterials, antennas, semiconductor devices, photonics, machine learning, power generation and delivery, renewable energy, and power electronics. A full range of state-of-the-art laboratories is available, enabling faculty and students to conduct research at the cutting edge of technology.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Department of Electrical and Computer Engineering seeks the following from applicants to the Master's programs in Electrical Engineering:

Applicants should have baccalaureate degrees in electrical and/or computer engineering with a GPA of at least 3.0 out of 4.0. Applicants with baccalaureate degrees in fields closely related to electrical and computer engineering (e.g., electronics, computer science, mathematics, physics, etc.) may also be considered. However, satisfactory evidence on the aptitude to pursue graduate studies in electrical and computer engineering must be demonstrated. If additional preparatory courses are required, such courses should be taken before applying for the MSEE.

Applicants must have also satisfactory scores in the quantitative and verbal sections of the Graduate Record Examinations (GRE) general test. The GRE requirement will be waived for:

- Applicants who have an undergraduate degree from an ABET-accredited U.S. institution and have at least

three years post-graduation experience in the related field

- Recent UNC Charlotte undergraduates with a minimum GPA of 3.25
- Currently enrolled UNC Charlotte undergraduate students eligible for the MSEE Early Entry Program with a minimum GPA of 3.25

Admission is based on the overall background, motivation, and potential, as determined by the department.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The MSEE degree requires successful completion of 30 graduate credit hours as approved by the student's graduate advisor. This can be done with one of three options:

- 1) Thesis option - the student completes 9 credit hours of thesis (ECGR 6991) and 21 credit hours of coursework
- 2) Project option - the student completes 3 credit hours of individual study and projects (ECGR 6890) and 27 credit hours of coursework
- 3) Comprehensive Examinations option - the student completes 30 credit hours of coursework and pass a comprehensive written examination

The 30 credit hours must be completed in accordance with the following criteria: a) Technical Area of Focus (at least 9 credit hours) and b) Breadth of Knowledge (at least 6 credit hours). The remaining credit hours can be completed using thesis, project, and/or coursework.

All students must also meet the Advanced Knowledge criteria that requires at least 12 credit hours to be at the 6000-level or above, with at least 3 credit hours at the 6000-level or above in the chosen Technical Area of Focus. No more than 6 credit hours may be in Individual Study. No more than 6 credit hours may be from courses outside the Department of Electrical and Computer Engineering, unless approved by the student's graduate advisor.

Technical Area of Focus (9 credit hours)

Select three courses from a single technical area of focus. Special topic courses (ECGR 6090 or ECGR 8090) may

also be counted towards this requirement, as approved by the student's graduate advisor.

Communications and Networking

ECGR 5187 - Data Communications and Networking II (3)
 ECGR 5191 - Analog and Digital Communication (3)
 ECGR 6120 - Wireless Communication and Networking (3)
 ECGR 6121 - Advanced Theory of Communications I (3)
 ECGR 6165 - Information Theory (3)
 ECGR 6187 - Modeling and Analysis of Communication Networks (3)
 ECGR 6188 - Fundamentals of Wireless Systems and Protocols (3)
 ECGR 6189 - Wireless Sensor Networks (3)

Signal and Image Processing

ECGR 5103 - Machine Vision, AI and Image Processing (3)
 ECGR 5105 - Introduction to Machine Learning (3)
 ECGR 5106 - Real-Time Machine Learning (3)
 ECGR 5116 - Artificial Intelligence for Biomedical Applications (3)
 ECGR 5117 - AI for Robotics and Automation (3)
 ECGR 5122 - Random Processes and Optimum Filtering (3)
 ECGR 5124 - Digital Signal Processing (3)
 ECGR 5127 - Machine Learning for the Internet of Things (3)
 ECGR 5190 - Acoustics (3)
 ECGR 6114 - Digital Signal Processing II (3)
 ECGR 6118 - Applied Digital Image Processing (3)
 ECGR 6119 - Applied Artificial Intelligence (3)
 ECGR 6126 - Optimization for Machine Learning (3)
 ECGR 6127 - Medical Signal Processing (3)

Controls and Robotics

ECGR 5111 - Control Systems (3)
 ECGR 5112 - Nonlinear Analysis (3)
 ECGR 5115 - Convex Optimization and AI Applications
 ECGR 5117 - AI for Robotics and Automation (3)
 ECGR 5161 - Control of Robotic Manipulators (3)
 ECGR 5196 - Introduction To Robotics (3)
 ECGR 5412 - Principles of Digital Control Systems (3)
 ECGR 6111 - Linear Systems Theory (3)
 ECGR 6115 - Optimal Control Theory (3)
 ECGR 6116 - Foundations of Reinforcement Learning and Optimal Control (3)

Electromagnetics, Antennas, and RF

ECGR 5121 - Antennas (3)
 ECGR 5123 - Advanced Electromagnetic Field Theory (3)
 ECGR 5261 - Microwave Circuit Design I (3)
 ECGR 6264 - Radio Frequency Design (3)

Electronic Devices and Systems

ECGR 5125 - Foundation of Optical Engineering (3)
 ECGR 5132 - Analog Integrated Circuit Design (3)
 ECGR 5133 - VLSI Systems Design (3)

ECGR 5136 - Semiconductor Optoelectronic Materials and Devices (3)
 ECGR 5431 - Linear Integrated Electronics (3)
 ECGR 6132 - Advanced Semiconductor Device Physics (3)

Power Systems

ECGR 5104 - Computational Methods in Power Systems (3)
 ECGR 5142 - Power Generation: Operation and Control (3)
 ECGR 5171 - Introduction to Energy Systems (3)
 ECGR 5172 - Energy Markets (3)
 ECGR 5193 - Power System Analysis I (3)
 ECGR 5194 - Power System Analysis II (3)
 ECGR 6144 - Electric Power Distribution Systems I (3)
 ECGR 6145 - Electric Power Distribution Systems II (3)
 ECGR 6147 - Power System Stability and Control (3)
 ECGR 6173 - Power Quality (3)
 ECGR 6190 - Smart Grid: Characteristics, Design, and Analysis (3)

Power Electronics and Machines

ECGR 5144 - Power Electronics I (3)
 ECGR 5195 - Electrical Machinery (3)
 ECGR 6197 - Power Electronics II (3)

Breadth of Knowledge Requirement (6 credit hours)

Select courses from at least two technical areas listed above other than the chosen technical area of focus. Courses in the M.S. in Computer Engineering can also be taken to fulfill the breadth of knowledge requirement.

Advanced Knowledge Requirement (12 credit hours)

At least 12 credit hours must be taken at the 6000-level or above. At least 3 credit hours at the 6000-level or above should be in the student's chosen Technical Area of Focus.

Thesis, Project, and Comprehensive Examination Options

Select one of the following options to complete the degree requirements:

Thesis Option

In the Thesis Option, students must complete 9 credit hours of thesis research.

- 1) Plan of Study - students must meet with their advisor to formulate a plan of study and get the committee's approval. The plan of study must be submitted after completing at least 9 but no more than 18 credit hours.
- 2) Satisfactory completion of 30 credit hours of approved graduate credits in major or related area of study including 9 credit hours of thesis.
- 3) Admission to Candidacy
- 4) Thesis Defense - a copy of the thesis should be distributed to each member of the program committee at least two weeks prior to the defense. Students should make a public announcement of the defense within the department to allow attendance by

interested faculty members and students of electrical and computer engineering.

For the thesis option, students must select a program committee that is composed of at least 3 members of the graduate faculty, the majority of whom must be members of the Department of Electrical and Computer Engineering. The graduate program advisor generally serves as the chairman of the committee.

Non-Thesis/Project Option

In this option, students may complete the requirements of the Master's degree under the Non-Thesis/Project Option by taking 30 credit hours of coursework only, or by taking 27 credit hours of coursework along with 3 credits of individualized project work.

- 1) Plan of Study - students must meet with their advisor to formulate a plan of study and get the committee's approval. The plan of study must be submitted after completing at least 9 but no more than 18 credit hours.
- 2) Satisfactory completion of 30 credit hours of approved graduate credits. At least 24 credit hours of courses must be in the ECE department.
- 3) A student must take three credits of individualized project (ECGR 6890) that will require a written report and an oral presentation.
- 4) Admission to Candidacy
- 5) Students must pass an oral exam during the presentation of the project that is administered by the program advisory committee.

For the non-thesis/project option, the student's advisor alone plays the roles of the program committee (i.e., no other members are required).

Comprehensive Examination Option

- 1) Plan of Study - students must meet with their advisor to formulate a plan of study and get the committee's approval. The plan of study must be submitted after completing at least 9 but no more than 18 credit hours.
- 2) Satisfactory completion of 30 credit hours of approved graduate coursework. At least 21 credit hours of courses must be in the ECE department.
- 3) Admission to Candidacy
- 4) Students must pass a written comprehensive examination that is administered by the department. Students receive two chances to successfully pass the comprehensive examinations.

Optional Concentration in Power and Energy Systems

The Department of Electrical and Computer Engineering offers an optional Concentration in Power and Energy Systems for the MSEE degree, which requires taking a set of courses from the Power Systems, the Power Electronics

and Machines, and the Controls and Robotics technical areas of focus. Students who elect to pursue the Concentration in Power and Energy Systems towards their MSEE degree primarily take coursework in modern power and energy systems, devices modeling, analysis, protection and control. This concentration prepares students for jobs with power utilities, power and energy devices manufacturing companies, national and regional laboratories, or for continued academic training in power and energy fields. Students in the concentration may select either the Power Systems track or the Power Electronics and Machines track, depending on their selected technical area of focus.

The concentration is reflected in the student's transcript upon successful completion of the MSEE program. Students interested in earning their MSEE degree with the concentration must indicate their interest in this option in their Plan of Study that must be submitted within their second semester into the MSEE program. The MSEE degree can also be earned without specifying a concentration, where the student has greater flexibility in selecting their courses.

In order to earn a MSEE degree with a Concentration in Power and Energy Systems, students must take:

For the Power Systems Track:

- a minimum of 3 courses in the Power Systems technical area of focus - also satisfying the Technical Area of Focus requirement of the MSEE degree;
- a minimum of 1 course in each of the following technical areas of focus: Power Electronics and Machines, and Controls and Robotics - also satisfying the Breadth of Knowledge requirement of the MSEE degree;

For the Power Electronics and Machines Track:

- a minimum of 3 courses in the Power Electronics and Machines technical area of focus - also satisfying the Technical Area of Focus requirement of the MSEE degree;
- a minimum of 1 course in each of the following technical areas of focus: Power Systems, and Controls and Robotics - also satisfying the Breadth of Knowledge requirement of the MSEE degree.

In addition to the requirements above, students seeking a graduate concentration must also complete the general requirements for the MSEE degree for their chosen option (thesis, project, or course-only exam option). It is noted that the concentration courses may be used to fulfill the MSEE degree requirements: Technical Area of Focus, Breadth of Knowledge, and Advanced Knowledge requirements.

Optional Concentration in Artificial Intelligence and Machine Learning (AI and ML)

The Department of Electrical and Computer Engineering offers a Concentration in Artificial Intelligence and Machine Learning (AI and ML) for the MSEE program. The concentration requires taking one core course and three courses from a list of approved electives. The Concentration in AI and ML empowers students to design intelligent and autonomous systems across various domains. It emphasizes the application of machine learning and data mining to solve real-world challenges and integrates intelligent behavior into computing platforms.

Machine Learning, a pivotal domain influencing numerous industries, is a key focus of this concentration. Students will acquire the expertise to choose, modify, optimize, or create machine learning algorithms tailored for specific applications. They will also learn to evaluate their efficacy, familiarize themselves with related software and hardware tools, manage and visualize diverse data sets, and interpret methods from the machine learning literature. With the knowledge from the Concentration in AI and ML, students are positioned for success in fields like data mining, robotics, natural language processing, and computer vision.

This concentration delves into topics such as computer vision, natural language processing, robotics, deep learning, and knowledge acquisition. Courses emphasize real-world machine learning applications in engineering systems, offering students a deeper understanding of practical machine learning deployment. Specific focus areas include anomaly detection, defect detection, predictive maintenance, intelligent scheduling, and resource allocation. Additionally, the concentration highlights the application of machine learning and advanced language models to real-world engineering tasks like reasoning, design, validation, and testing. Emerging trends in machine learning, such as generative AI and large pre-trained transformers, which promise to revolutionize future engineering systems, are also covered. The curriculum ranges from foundational subjects to more advanced, application-centric topics within broader engineering systems.

The concentration is reflected in the student's transcript upon successful completion of the MSEE program. Students interested in earning their MSEE degree with the concentration must indicate their interest in this option in their Plan of Study which must be submitted within their second semester into the master's program. The MSEE degree can also be earned without specifying a concentration, where the student has greater flexibility in selecting their courses.

In order to earn a MSEE degree with a Concentration in AI and ML, a student must take:

Core Course

ECGR 5105 - Introduction to Machine Learning (3)

Any 3 elective courses from the approved list below, with at least one at the 6000 level:

ECGR 5103 - Machine Vision, AI and Image Processing (3)

ECGR 5106 - Real-Time Machine Learning (3)

ECGR 5115 - Convex Optimization and AI Applications

ECGR 5116 - Artificial Intelligence for Biomedical Applications (3)

ECGR 5117 - AI for Robotics and Automation (3)

ECGR 5127 - Machine Learning for the Internet of Things (3)

ECGR 6116 - Foundations of Reinforcement Learning and Optimal Control (3)

ECGR 6119 - Applied Artificial Intelligence (3)

ECGR 6126 - Optimization for Machine Learning (3)

In addition to the requirements above, students seeking a graduate concentration must also complete the general requirements for the MSEE degree for their chosen option (thesis, project, or course-only exam option). It is noted that the concentration courses may be used to fulfill the MSEE degree requirements: Technical Area of Focus, Breadth of Knowledge, and Advanced Knowledge requirements.

Degree Total = 30 Credit Hours

Application for Degree

Students preparing to graduate must submit an online Application for Degree by the filing date specified in the University Academic Calendar. If a student does not graduate in the semester identified on the Application for Degree, then the student must update their Admission to Candidacy and submit a new Application for Degree for graduation in a subsequent semester.

APPLIED ENERGY AND ELECTROMECHANICAL ENGINEERING

- M.S. in Applied Energy and Electromechanical Engineering
- Graduate Certificate in Applied Energy

Department of Engineering Technology and Construction Management
et.charlotte.edu

M.S. in Applied Energy and Electromechanical Engineering

The M.S. in Applied Energy and Electromechanical Engineering degree provides an opportunity for discipline-specific and multidisciplinary graduate level education. Advanced coursework and research are used to enhance professional development, improve technical competency, and initiate a lifelong learning experience. Full-time students typically take three semesters to complete the program.

Admission Requirements

The minimum admission requirements for the program are:

- An earned undergraduate degree in engineering, engineering technology, energy, or a closely related field
- An undergraduate GPA of 3.0 or above
- Positive recommendations
- An acceptable TOEFL score is required if the previous degree was from a country where English is not the common language
- Integral and differential calculus (MATH 1121 or MATH 1241 or ETGR 2171, and ETGR 2272 or MATH 1242 at UNC Charlotte or equivalent from other institutions)
- Applicants may optionally submit GRE scores for inclusion in their admission package for the verbal, quantitative, and analytical sections.
- Other credentials as required by the Graduate School
- Admission is based on the overall background, motivation, and potential, as determined by the program

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the

baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The program leading to the Master of Science engineering degree in Applied Energy and Electromechanical Engineering is a 30 credit hour program. **Students select one of the three options described below;** each contains requirements to complete core courses, elective courses, and a capstone experience.

Option A: Thesis

Requires the formation of a Master's Committee consisting of members of the Graduate Faculty, to be chaired by a member of the Department.

Requires successful completion of 24 credit hours of graduate-level coursework, research, and a thesis:

- 3 credit hours of Mathematics
- 6 credit hours of prescribed core courses
- 15 credit hours of electives
- 6 credit hours of research
- Successful oral defense of thesis work by the student's Master's Committee
- Acceptance of written thesis by the student's Master's Committee

Option B: Project (Non-thesis)

Requires successful completion of 27 credit hours of graduate-level coursework and a Capstone Project:

- 3 credit hours of Mathematics
- 6 credit hours of prescribed core courses
- 18 credit hours of electives
- 3 credit hours of individualized project work (as AEEE-6850), concluding in a paper and successful presentation to graduate faculty members

Option C: Comprehensive Exam (Non-thesis)

Requires successful completion of 30 credit hours of graduate-level coursework and students must pass a written comprehensive that is administered by the program:

- 3 credit hours of Mathematics
- 6 credit hours of prescribed core courses
- 21 credit hours of electives
- passing a written comprehensive that is administered by the program

Mathematics Course (3 credit hours)

Select one of the following:

- AEEE 5274 - Applied Computational Methods (3)
- ETGR 5272 - Engineering Analysis IV (3)
- MATH 5165 - Numerical Linear Algebra (3)
- MATH 5172 - The Finite Element Method (3)

MATH 5173 - Ordinary Differential Equations (3)
 MATH 5174 - Partial Differential Equations (3)
 MATH 5176 - Numerical Methods for Partial Differential Equations (3)

Core Courses (6 credit hours)

AEEE 6120 - Energy Generation and Conversion (3)
 AEEE 6150 - System Dynamics (3)

Elective Courses (Option A: 15 credit hours; Option B: 18 credit hours; Option C: 21 credit hours)

Students must take the prescribed number of elective credit hours (based on their chosen Option) from the following list. Additional elective courses may be offered occasionally as Special Topics based on industry needs and faculty research interests.

In addition, appropriate existing graduate-level courses from other programs may be approved by the Graduate Program Director, not to exceed six credit hours from outside of the department. (Courses are listed grouped by focus area, but a student can pick any mix of electives from the entire list.)

Renewable Energy & Modern Grids

AEEE 5010 - Special Topics in Energy (1 to 3)
 AEEE 5140 - Energy Management (3)
 AEEE 5250 - Analysis of Renewable Energy Systems (3)
 AEEE 5265 - Solar Photovoltaic Systems (3)
 AEEE 5275 - Building Environmental Systems (3)
 AEEE 5295 - High Voltage Technology (3)
 AEEE 6135 - Energy Transmission and Distribution (3)
 AEEE 6235 - Modern Electric Power Grids (3)

Robotic & Automated Systems

AEEE 5020 - Special Topics in Electromechanical (1 to 3)
 AEEE 5150 - Manufacturing Automation (3)
 AEEE 5155 - Agile Design of Automated Systems (3)
 AEEE 5196 - Introduction to Robotics (3)
 AEEE 5270 - Cyber-physical Systems (3)
 AEEE 5285 - Applied Noise and Vibration Control (3)
 AEEE 6170 - Applied Mechatronics (3)
 AEEE 6270 - Dynamic Systems Control and Design (3)

Multidisciplinary Electives

AEEE 5000 - Special Topics (1 to 3)
 AEEE 5123 - Signal Conditioning and Filtering (3)
 AEEE 5152 - Discrete-time Signals and Systems (3)
 AEEE 5290 - Advanced Instrumentation (3)
 AEEE 6260 - Thermal Fluid Systems Modeling (3)
 AEEE 6800 - Independent Study (1 to 3)
 CMET 5135 - Building Information Modeling (3)
 CMET 6270 - Operation of Constructed Facilities (3)

Capstone Experiences

Thesis Research (Option A students) (6 credit hours)

For this capstone experience, students must take a total of 6 credit hours of Master's Research and Thesis; this is normally taken across two semesters of 3 credit hours each. During these 6 credit hours, students must conduct research on an approved topic, leading to the writing and defending of a thesis (in accordance with Graduate School policies).

AEEE 6901 - Master's Research & Thesis I (3)

AEEE 6902 - Master's Research & Thesis II (3)

Project Research (Option B students) (3 credit hours)

This capstone experience requires individual investigation in the form of a project in the areas of Applied Energy and/or Electromechanical Engineering culminating in an exposition of results in the form of a formal presentation to faculty and a professional conference-formatted paper. The proposed project must be pre-approved by a mentoring member of the program graduate faculty and the Graduate Program Director.

AEEE 6850 - Capstone Project (3)

Comprehensive Examination (Option C students)

The comprehensive examination is a written exam to be offered once in the fall and once in the spring semesters. A student's exam will be scheduled when they have at least 24 credit hours completed or in progress. The Program Director and the examining committee will coordinate the examination. The exam will measure the student's mastery of theories and applications in the discipline. Students will have only two opportunities to receive passing marks on the examination.

Degree Total = 30 Credit Hours

Grade Requirements

All candidates must earn an overall 3.0 GPA to graduate. Accumulation of one U grade will result in the suspension of the student's enrollment in the program.

Advising

Each student is advised by the Graduate Program Director and may be supervised by their graduate advisor and/or their program Master's Thesis Committee.

Application for Degree

Each student must apply for graduation by the published deadline in their final term. Students who apply to graduate but fail to finish will need to update their application to graduate to a future term.

Plan of Study Requirements

Each student is required to submit a Plan of Study to and receive approval from the program's Graduate Program Director before completing 9 graduate credit hours. The

Plan may be reviewed and updated periodically with the approval of the Graduate Program Director.

Transfer Credit

The department, at its discretion, may accept transfer of graduate courses (6 credit hours maximum) taken at another institution or from another program prior to admission to the M.S. in Applied Energy and Electromechanical Engineering program. Only courses in which the student earned a grade of B or above may be transferred.

Assistantships

Research and teaching assistantships are available from the Department on a competitive basis to highly qualified applicants/students.

Tuition Grants

Tuition grants including out-of-state tuition differential waivers and in-state tuition support are available on a competitive basis for both out-of-state and in-state students, respectively.

Graduate Certificate in Applied Energy

The Graduate Certificate in Applied Energy provides graduate students and professionals with the opportunity to reach a demonstrated level of competence in applied energy. Each course in this certificate is applicable toward either the M.S. in Applied Energy and Electromechanical Engineering or the M.S. in Construction and Facilities Engineering degree requirements. The graduate certificate may act as a standalone graduate option for post-baccalaureate students, or may be pursued concurrently with the M.S. in Applied Energy and Electromechanical Engineering or the M.S. in Construction and Facilities Engineering degree programs at UNC Charlotte.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Department of Engineering Technology and Construction Management seeks the following:

- Either a bachelor's degree in engineering, engineering technology, construction management or a closely related technical or scientific field.
- Undergraduate coursework of at least 3 semesters in engineering analysis or calculus
- An average GPA of 3.0 (out of 4.0)
- Applicants whose native language is not English, will need to satisfy the UNC Charlotte Graduate School's English proficiency requirements.

Early Entry Program

Undergraduate students with a GPA of 3.2 or above and with at least 75 credit hours completed toward a baccalaureate degree in Engineering or Engineering Technology at UNC Charlotte may be admitted as an Early Entry student provided they meet all other requirements of admission except the earned bachelor's degree.

Certificate Requirements

The certificate is awarded upon completion of four graduate-level courses (12 credit hours) in the area of applied energy. The cumulative GPA must be at least 3.0 and at most one course with a grade of C may be allowed toward the certificate. Requests for other energy-related course substitutions may be approved at the discretion of the program director.

Select four of the following:

- AEEE 5000 - Special Topics (1 to 3)
- AEEE 5140 - Energy Management (3)
- AEEE 5250 - Analysis of Renewable Energy Systems (3)
- AEEE 5265 - Solar Photovoltaic Systems (3)
- AEEE 5274 - Applied Computational Methods (3)
- AEEE 5275 - Building Environmental Systems (3)
- AEEE 5295 - High Voltage Technology (3)
- AEEE 6120 - Energy Generation and Conversion (3)
- AEEE 6135 - Energy Transmission and Distribution (3)
- AEEE 6150 - System Dynamics (3)
- AEEE 6235 - Modern Electric Power Grids (3)

Certificate Total = 12 Credit Hours

ENGINEERING MANAGEMENT

- **M.S. in Engineering Management**
 - o Energy Analytics
 - o Lean Logistics and Supply Chains
 - o Systems Analytics

Department of Industrial and Systems
Engineering

seem.charlotte.edu

M.S. in Engineering Management

The Master of Science in Engineering Management (MSEM) program prepares professionals for careers in managing projects, programs, systems, and organizations. Industrial, research, consulting, and commercial firms now demand engineering managers with both cutting-edge technical competence and the management skills necessary to forge linkages with the systems and business sides of these organizations. System analytics skills such as data visualization techniques, data warehousing and management for supporting system-wide decision-making, data-driven optimization methods for modeling, as well as simulation and quality control, are keys to developing novel solutions and to resolving organizational challenges with speed and accuracy. These managers must be able to form and manage high performance teams and manage business and technological operations. The program of study is necessarily multidisciplinary, combining elements of advanced study in various engineering disciplines with studies of business and system operations and organizational behavior.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Engineering Management program seeks the following from applicants to the M.S. in Engineering Management program:

- 1) Either a bachelor's degree in engineering or a closely related technical or scientific field, or a bachelor's degree in business, provided relevant technical course requirements have been met
- 2) Undergraduate coursework in college calculus
- 3) An average GPA of 3.0 or above (on a 4.0 scale)

Note: Undergraduate coursework in engineering economics, linear algebra, statistics, and computer programming is preferred.

Documents to be Submitted for Admission

- 1) Transcript(s) showing a baccalaureate degree in engineering, engineering technology, or a scientific discipline, or a baccalaureate degree in business administration from a college or university accredited by an accepted accrediting body
- 2) Written descriptions of any relevant and significant work experience
- 3) Applicants whose native language is not English will need to satisfy the UNC Charlotte Graduate School's English proficiency requirements.
- 4) A satisfactory score on the General Test of the GRE or GMAT (optional)

GRE Waiver

Applicants with more than 2 years of relevant industry experience and a bachelor's degree in engineering from a U.S. ABET-EAC accredited program may have the GRE requirement waived. A waiver can be requested by submitting a transcript of the school and a statement detailing work experience.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

Students are responsible for verifying degree requirements listed in DegreeWorks and consulting with the Graduate Program Director regarding the study plan. Students select one of two options described below.

Option 1: Project

Complete 10 credit hours of core courses, 1 credit hour of Engineering Management Project I (EMGT 6891), and 2 credit hours of Engineering Management Project II (EMGT 6892). Completion of EMGT 6891 and EMGT 6892 includes oral and written exams administered by the project advisor. In addition, the following elective/concentration courses must be completed:

- Elective/Concentration Courses for No Concentration - six elective courses (18 credit hours) from the approved list of electives.
- Elective/Concentration Courses for One Concentration - four courses (12 credit hours) for selected concentration and two elective courses (6 credit hours) from the approved list of electives.
- Elective/Concentration Courses for Two Concentrations* - eight courses (24 credit hours) for

selected two concentrations. No elective courses are required.

** Option 1: Project with two concentrations requires successful completion of 37 credit hours.*

Option 2: Thesis

Complete 10 credit hours of core courses and 6 credit hours of Graduate Master Thesis Research (EMGT 6991). Successful completion of EMGT 6991 includes oral and written exams administered by the thesis committee in accordance with the guideline of the Graduate School. In addition, the following elective/concentration courses must be completed:

- Elective/Concentration Courses for No Concentration - five elective courses (15 credit hours) from the approved list of electives.
- Elective/Concentration Courses for One Concentration - four courses (12 credit hours) for selected concentration and one elective course (3 credit hours) from the approved list of electives.
- Elective/Concentration Courses for Two Concentrations** - eight courses (24 credit hours) for selected two concentrations. No elective courses are required.

*** Option 2: Thesis with two concentrations requires successful completion of 40 credit hours.*

Required Core Courses (10 credit hours)

Complete at least 6 credit hours of required core courses before enrolling in 6000-level courses.

EMGT 6980 - Industrial and Technology Management Seminars (1) *(Students should complete this course in the first semester of the program.)*

EMGT 5201 - Fundamentals of Deterministic System Analysis (3)

EMGT 5202 - Fundamentals of Stochastic System Analysis (3)

EMGT 5203 - Fundamentals of Engineering Management (3)

Concentration Courses (12 credit hours)

Energy Analytics Concentration

While traditional power and energy education focuses on the engineering aspect of energy systems, today's energy industry is facing fierce competitions in the data science field. The Energy Analytics concentration of UNC Charlotte's MSEM program prepares the students for the data science career in the energy industry, so that the graduates can make informed decisions by extracting actionable insights from data.

Required Courses (12 credit hours)

Select four of the following. At least two of which must be EMGT 5961, EMGT 5962, and EMGT 5963.

EMGT 5961 - Introduction to Energy Systems (3)

EMGT 5962 - Energy Markets (3)

EMGT 5963 - Energy Systems Planning (3)

EMGT 5964 - Case Studies in the Energy Industry (3)

EMGT 6910 - Forecasting Techniques, Methodologies, and Practice (3)

EMGT 6965 - Energy Analytics (3)

Logistics and Supply Chains Concentration

The main objective of the Logistics and Supply Chains concentration is to build fundamental engineering management skills to effectively design, plan, and execute supply and logistics networks that deliver value to customers. This concentration helps students understand the principles of logistics and supply chain management, and provides them with the related decision-making and optimization methodologies, as well as analytical and continuous improvement tools and techniques to make the companies deliver goods and services successfully.

Required Courses (12 credit hours)

Select four of the following:

EMGT 5114 - Production Control Systems (3)

EMGT 5141 - Engineering Experimental Design (3)

EMGT 5170 - Total Quality Systems (3)

EMGT 6142 - Quality and Manufacturing Management (3)

EMGT 6901 - Advanced Project Management (3)

EMGT 6905 - Designed Experimentation (3)

EMGT 6920 - Logistics Engineering and Management (3)

EMGT 6924 - Lean Six Sigma Practice and Management (3)

EMGT 6926 - Supply Network Analysis (3)

Systems Analytics Concentration

Analytics helps the decision maker understand the system and make the best decision to improve the system. The Systems Analytics concentration offers balanced learning experiences on theoretical fundamentals as well as practical skills for a wide range of applications. Theoretical fundamentals train students to approach complex problems with rigorous logic and creativity. Practical skills equip students with computational problem-solving tools.

Required Courses (12 credit hours)

Select four of the following:

EMGT 5141 - Engineering Experimental Design (3)

EMGT 5142 - Reliability Management and Survival Analysis (3)

EMGT 6112 - Introduction to Dynamic Programming and Optimal Control (3)

EMGT 6113 - Cluster Analysis and Applications (3)

EMGT 6116 - System Identification and Reinforcement Learning (3)

EMGT 6905 - Designed Experimentation (3)

EMGT 6906 - Processing Systems Simulation (3)

EMGT 6910 - Forecasting Techniques, Methodologies, and Practice (3)
 EMGT 6912 - Computational Intelligence (3)
 EMGT 6915 - Engineering Decision and Risk Analysis (3)
 EMGT 6952 - Engineering Systems Optimization (3)
 EMGT 6955 - Systems Reliability Engineering (3)
 EMGT 6965 - Energy Analytics (3)

Approved Elective Courses

Depending on the degree and concentration options selected, remaining credit hours may be filled by taking elective courses. Any course from the Engineering Management Program, including the ones below, may be taken as an elective course.

EMGT 5090 - Special Topics (3)
 EMGT 5114 - Production Control Systems (3)
 EMGT 5141 - Engineering Experimental Design (3)
 EMGT 5142 - Reliability Management and Survival Analysis (3)
 EMGT 5150 - Leadership For Engineers (3)
 EMGT 5154 - Bayesian Analysis for Human Decision (3)
 EMGT 5170 - Total Quality Systems (3)
 EMGT 5961 - Introduction to Energy Systems (3)
 EMGT 5962 - Energy Markets (3)
 EMGT 5963 - Energy Systems Planning (3)
 EMGT 5964 - Case Studies in the Energy Industry (3)
 EMGT 6090 - Special Topics (1 to 6)
 EMGT 6112 - Introduction to Dynamic Programming and Optimal Control (3)
 EMGT 6113 - Cluster Analysis and Applications (3)
 EMGT 6116 - System Identification and Reinforcement Learning (3)
 EMGT 6142 - Quality and Manufacturing Management (3)
 EMGT 6901 - Advanced Project Management (3)
 EMGT 6902 - Legal Issues in Engineering - Management (3)
 EMGT 6905 - Designed Experimentation (3)
 EMGT 6906 - Processing Systems Simulation (3)
 EMGT 6910 - Forecasting Techniques, Methodologies, and Practice (3)
 EMGT 6912 - Computational Intelligence (3)
 EMGT 6915 - Engineering Decision and Risk Analysis (3)
 EMGT 6920 - Logistics Engineering and Management (3)
 EMGT 6924 - Lean Six Sigma Practice and Management (3)
 EMGT 6926 - Supply Network Analysis (3)
 EMGT 6930 - Capital Cost Estimating (3)
 EMGT 6950 - Engineering Systems Integration (3)
 EMGT 6952 - Engineering Systems Optimization (3)
 EMGT 6955 - Systems Reliability Engineering (3)
 EMGT 6965 - Energy Analytics (3)
 EMGT 6985 - Engineering Management Project (3)
 EMGT 6990 - Industrial Internship (1 to 3)

Note: Two relevant graduate courses from other programs may be taken as elective courses for the engineering management degree with approval of the

MSEM program. Courses completed from other departments as part of the M.S. concentrations count towards the two allowed electives. Students are responsible for fulfilling the prerequisites of the courses they plan to take from other graduate programs.

The following are recommended MBAD courses for electives:

MBAD 6141 - Operations Management (3)
 MBAD 6161 - Human Behavior in Organizations (3)
 MBAD 6164 - Executive Communications (3)
 MBAD 6165 - Negotiation and Conflict Management (3)

Note: Students are required to have adequate preparation prior to taking the required MBAD (Master of Business Administration) courses. Traditionally, this consists of at least completing courses in engineering economics, foundations of economics, and mathematics through differential and integral calculus. Students are advantaged by having completed courses in foundations of accounting and statistics.

Degree Total = 31 Credit Hours

Application for Degree

Students preparing to graduate must submit an online Application for Degree by the filing date specified in the University Academic Calendar. If a student does not graduate in the semester identified on the Application for Degree, then the student must update their Admission to Candidacy and submit a new Application for Degree for graduation in a subsequent semester.

FIRE PROTECTION AND SAFETY MANAGEMENT

• M.S. in Fire Protection and Safety Management

Department of Engineering Technology and Construction Management
et.charlotte.edu

M.S. in Fire Protection and Safety Management

The Fire Protection and Safety Management program is designed to provide the necessary knowledge and skills for professionals in Fire Safety or Occupational Safety to begin work in many areas of their respective fields and to solve safety problems in a complex technical society. The program consists of a common core with the balance of coursework allowing students to specialize in fire protection/administration or occupational safety management.

Fire Administration coursework prepares those who are engaged in occupations in the fire, emergency services, and safety fields to effectively manage the administrative decision-making requirements of both public and private entities.

Occupational Safety Management coursework prepares professionals to evaluate industrial hazards, assess risk, and develop safety management plans while addressing industrial hygiene, environmental pollution control, ergonomics, and human factors.

Admission Requirements

The minimum admission requirements for the program are:

- 1) An earned undergraduate degree in engineering, engineering technology, emergency management, fire safety, fire protection, occupational safety, industrial hygiene, safety management, or a related technical or scientific discipline
- 2) A minimum undergraduate GPA of 3.0
- 3) Positive recommendations
- 4) Applicants whose native language is not English, will need to satisfy the UNC Charlotte Graduate School's English proficiency requirements.
- 5) Other credentials as required by the Graduate School

Documents to be Submitted for Admission

- 1) UNC Charlotte application for graduate admission online
- 2) Official transcripts from all colleges and universities attended
- 3) Official TOEFL scores or other criteria to meet English Proficiency requirements of the Graduate School
- 4) An essay detailing the applicant's motivation and career goals, along with any specific research and training interests
- 5) Three professional recommendations
- 6) Others as required by the Graduate School

Application Deadline

Applications can be received by the Graduate Admission Office any time prior to their published deadlines. In order to be considered for assistantships and tuition grants for the following academic year, students should apply by March 1 for priority consideration. The first round of award decisions typically occur by March 15. However, the Department of Engineering Technology and Construction Management will evaluate applications for admission at any time complete applications are received by the Graduate School.

To start a program in a given term, the following guidelines should be considered:

- Fall Semester (August) Application Submission Deadline: **August 1**
- Spring Semester (January) Application Submission Deadline: **December 1**
- Summer Semester (May or July) Application Submission Deadline: **April 15 or June 15**, dependent on term registered.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The minimum requirement for the M.S. in Fire Protection and Safety Management degree is 30 credit hours beyond the baccalaureate degree. This includes a minimum of 24 credit hours of formal coursework. Students enrolled will:

1. Complete a common core course of 3 CH on Industrial
2. Safety (MFPA 5223);
3. Choose a pathway for Fire Administration or Occupational Safety for focused coursework; and

4. Select directed electives to meet the 30 credit hour total. Students who elect the thesis option must complete 6 credit hours of MFPA 6900 as part of the directed electives. Students who select the non-thesis option will complete 30 credit hours of coursework and complete a comprehensive exam. The 30 credit hour degree program is outlined below:

Fire Administration Concentration (30 Credit Hours Total)

Students in the Fire Administration Concentration must take courses to meet the 30 credit hour program requirement with courses outlined below:

Core Courses (9 credit hours)

MFPA 5132 - Fire and Building Codes, Standards, and Practices (3)
 MFPA 5223 - Industrial Safety and Facilities Management (3)
 MFPA 6123 - Human Behavior in Fire (3)

Fire Administration Directed Elective (3 credit hours, Choose 1)

MFPA 5150 - Human Resources Management in Emergency Services (3)
 MFPA 5323 - Advanced Fire Service Administration (#)
 MPAD 6134 - Human Resources Management (3)

Community Risk Reduction Directed Elective (3 credit hours, Choose 1)

MFPA 5321 - Community Threat Assessment and Mitigation (3)
 MFPA 6120 - Public and Private Sector Interoperability (3)

Elective Courses (15 credit hours)

Select five of the following for a total of 15 credit hours:

CMET 5XXX - Construction Management Elective
 CMET 5000 - Special Topics - Construction Management (1 to 4)
 CMET 6000 - Special Topics in Construction and Facility Management (3)
 CMET 6240 - Safety and Risk Management (3)
 ETGR 5301 - Environmental Pollution Control (3)
 ETGR 5302 - Industrial Hygiene (3)
 ETGR 5303 - Applied Ergonomics and Human Factors (3)
 ETGR 5305 - System Safety Design and Management (3)
 GRAD 6100 - Basic Statistics and Probability (3)
 GRAD 6101 - Linear Regression (3)
 GRAD 6302 - Responsible Conduct of Research (2)
 MFPA XXXX - Elective MFPA Course
 MFPA 6000 - Special Topics in Fire Protection and Safety Management (3)
 MFPA 6243 - Research Investigation (3)
 MFPA 6800 - Independent Study (1 to 3)
 MFPA 6900 - Thesis (1 to 6)
 GRAD 6102 - Categorical Outcomes (3)
 GRAD 6240 - Research Ethics in the Biological and Behavioral Sciences (3)

MPAD 6104 - Public Organizations and Management (3)
 MPAD 6131 - Public Budgeting and Finance (3)
 MPAD 6142 - Grant Writing and Reporting (3)
 MPAD 6290 - Emergency Management (3)
 MPAD 6291 - Homeland Security and Terrorism (3)
 MPAD 6292 - Disaster Management (3)

Note: Additional new major elective courses may be created based on industry needs and faculty research interest. In addition, appropriate existing graduate level courses from other programs may be approved by the Graduate Program Director.

Occupational Safety Concentration (30 Credit Hours Total)

Students in the Occupational Safety Concentration must also take 18 CH of required courses and 12 CH of electives to meet the 30 credit hour program requirement with courses outlined below:

Occupational Safety Concentration Core Courses (18 credit hours)

Students in the Occupational Safety Concentration must complete the following:

ETGR 5301 - Environmental Pollution Control (3)
 ETGR 5302 - Industrial Hygiene (3)
 ETGR 5303 - Applied Ergonomics and Human Factors (3)
 ETGR 5305 - System Safety Design and Management (3)
 MFPA 5144 - Fire Protection Systems (3)
 MFPA 5223 - Industrial Safety and Facilities Management (3)

Occupational Safety Concentration Elective Courses (12 credit hours)

Choose 4 courses (12 credit hours) from the options below. Any pre-requisites for courses outside the program are the student's responsibility to meet:

- CMET 5XXX - Construction Management Elective
- CMET 5000 - Special Topics - Construction Management (1 to 4)
 CMET 6000 - Special Topics in Construction and Facility Management (3)
 CMET 6240 - Safety and Risk Management (3)
 GRAD 6100 - Basic Statistics and Probability (3)
 GRAD 6101 - Linear Regression (3)
 GRAD 6102 - Categorical Outcomes (3)
 GRAD 6240 - Research Ethics in the Biological and Behavioral Sciences (3)
 GRAD 6302 - Responsible Conduct of Research (2)
 MFPA 5132 - Fire and Building Codes, Standards, and Practices (3)
 MFPA 6000 - Special Topics in Fire Protection and Safety Management (3)
 MFPA 6123 - Human Behavior in Fire (3)
 MFPA 6243 - Research Investigation (3)

MFPA 6800 - Independent Study (1 to 3)
 MFPA 6900 - Thesis (1 to 6)
 MPAD 6290 - Emergency Management (3)
 MPAD 6291 - Homeland Security and Terrorism (3)
 MPAD 6292 - Disaster Management (3)

Additional elective courses outside the department may also be taken if approved by the graduate program director.

Capstone Experience

Students pursuing the M.S. in Fire Protection and Safety Management have two options to complete the 30 credit hour program as follows:

- 1) 24 credit hours of coursework plus 6 credit hours of thesis project (MFPA 6900)
- 2) 30 credit hours of coursework and a comprehensive examination

Both options require the formation of a program committee. The thesis option is reserved for students who are attending the on-campus program and are performing research under formal graduate research or teaching assistantships. Students receiving such assistantships may be required to pursue the thesis option. The thesis option requires students to submit a written thesis and orally defend their work before their program committee.

All non-thesis students must complete 30 credit hours of coursework and successfully complete a formal comprehensive examination. A student's exam is scheduled when they have at least 24 credit hours of course credit completed or in progress. The student's graduate advisor and the examining committee coordinates the examination (to be offered once in the Fall and once in the Spring semesters), preparing the exam with the assistance of members of the student's program committee. The exam measures the student's mastery of theories and applications in the selected area of specialization within the discipline. Students have only two opportunities to receive passing marks on the examination.

Other Requirements

The program has both a thesis and non-thesis track. After admission to candidacy, thesis students will complete a comprehensive oral exam while non-thesis students will complete a comprehensive written exam. Residence will be per Graduate School rules. There is no language requirement. While full-time students will typically take three semesters to complete the program, part-time students are expected to take no more than seven years to complete the program as per Graduate School rules.

Degree Total = 30 Credit Hours

Grade Requirements

All candidates must earn an overall 3.0 GPA to graduate. Accumulation of one U grade will result in the suspension of the student's enrollment in the program.

Advising

Each student is supervised by their graduate advisor and a program committee.

Application for Degree

Each student should submit an Application for Degree prior to graduation. If a student does not graduate in the semester identified on the Application, the student must complete a new form and repay the application fee to be considered for graduation in a subsequent semester.

Plan of Study Requirements

Each student is required to submit a Plan of Study to the Department's Graduate Director before completing 18 credit hours of graduate credits.

Transfer Credit

The department, at its discretion, may accept transfer of graduate courses (6 credit hours maximum) taken at another institution or from another program prior to admission to the M.S. in Fire Protection and Safety Management program. Only courses in which the student earned a grade of B or above may be transferred.

Assistantships

A limited number of research and teaching assistantships are available from the Department on a competitive basis to highly qualified applicants/students.

Tuition Grants

A limited number of tuition grants, including out-of-state tuition differential waivers and in-state tuition support, are available on a competitive basis for both out-of-state and in-state students, respectively.

INFRASTRUCTURE AND ENVIRONMENTAL SYSTEMS

• Ph.D. in Infrastructure and Environmental Systems

Graduate Program
ines.charlotte.edu

Ph.D. in Infrastructure and Environmental Systems

The Ph.D. in Infrastructure and Environmental Systems (INES) is an interdisciplinary program emphasizing: (a) innovations in design, analysis, construction and operation of urban, energy, and environmental infrastructures; (b) scientific analysis of environmental systems and contemporary sustainability issues; and (c) exploration of sustainable and renewable resources. The interplay between the environment and infrastructure is thoroughly studied by students as they confront the challenges facing urbanizing regions. INES engages a diverse group of talented faculty from the science, engineering and management disciplines. INES students are required to conduct interdisciplinary and original research that contributes new knowledge to the profession, as evidenced by scholarly publications in refereed journals. The program is intended to:

- 1) Provide students with educational opportunities in science, engineering, and management, culminating in an interdisciplinary research-based Ph.D. in Infrastructure and Environmental Systems
- 2) Involve students in emerging issues pertaining to infrastructure and the environment for promoting regional and national economic and social development, as well as policy implications
- 3) Prepare students for careers as research scientists, resources and systems managers, professional engineers and educators who are capable of advancing knowledge in sciences, technology, and management relevant to infrastructure and environmental systems

INES students can participate in multidisciplinary activities provided by the UNC Charlotte research centers such as the Infrastructure, Design, Environment, and Sustainability (IDEAS) Center; the Center for Applied Geographic Information Science (CAGIS); the Energy Production and Infrastructure Center (EPIC); the Center for Advanced Multimodal Mobility Solutions and Education; the Center

for Transportation Policy Studies; the NSF I/UCRC Sustainably Integrated Buildings and Sites; the Integrated Design Research Lab and the Urban Institute. Current areas of INES research can be categorized as follows:

- Architecture and landscape
- Building and infrastructure security
- Climate change and atmospheric dynamics
- Civil infrastructure and materials
- Earth and geo-environmental systems
- Ecological valuation and stream restorations
- Energy analytics
- Environmental science and technology
- Integrated building design and BIM
- Natural hazards and geophysics
- Quaternary geology and landform evolution
- Renewable energy and environmental economics
- Systems optimization and management
- Transportation systems analysis and operation
- Urban and regional planning
- Integrated watershed management

Program Learning Outcomes

Doctoral students engage in coursework that develops their competency for research. Students generate knowledge through research and become competent scientists and engineers. During this process, students acquire knowledge of foundation subjects and specialty areas within their focus of research and, as a result, they develop into professionals.

Specific outcomes of the INES program are that students completing the Ph.D. degree will demonstrate abilities to analyze and evaluate advanced topics in engineering and/or science, to communicate technical information effectively, to discover and create new knowledge, and to understand interactions among advanced topics in science, engineering, and management.

Admission Requirements

The following are general guidelines for successful admissions into the Ph.D. in Infrastructure and Environmental Systems program:

- The equivalent to a U.S. baccalaureate and a master's degree, from a college or university accredited by an accepted accrediting body, in architecture, construction, engineering, earth sciences, energy, environmental studies, geology, management, resources economics, transportation, or a related field with a minimum undergraduate GPA of 3.20 and a minimum graduate GPA of 3.50 (on a 4.00 scale) in all graduate work. Applicants meeting these requirements will be admitted to the Advanced Standing Track (see Degree Requirements for details).
- Applicants holding only baccalaureate degrees with an undergraduate GPA of 3.75 or above may be

considered for admission into the regular track (see Degree Requirements for details).

- Applicants working toward a master's degree or holding a master's degree in an unrelated field with a minimum GPA of 3.50 will be admitted into the regular track (see Degree Requirements for details).
- An acceptable TOEFL or IELTS score as required by the Graduate School for international students.
- Three letters of reference, two of which must be from faculty members.
- An essay of less than 500 words to address the applicant's motivation and research issues of interest.
- Students entering the program are expected to remediate any coursework deficiencies identified by their advisory committee in the first semester after enrolling in the program. The required coursework depends on the background of the student and is established by the INES Program Director and the student's research advisor.

Documents Required for Application of Admission

The Office of the Graduate School at UNC Charlotte requires the following documents be submitted in the application package for each student:

- 1) One official transcript from all colleges and universities attended
- 2) Official TOEFL or IELTS scores if the student's native language is not English
- 3) UNC Charlotte graduate online application
- 4) Three letters of reference
- 5) An essay which addresses the applicant's motivation and research issues of interest
- 6) A current curriculum vitae

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required.

Admission Assessment

- The INES Program Committee reviews applications and recommends to the Program Director whether each applicant should be admitted or not and, if so, under what conditions.
- For each entering student, a member of the INES faculty is selected to serve as the student's interim advisor for the first year of study.

Student Responsibility

Students entering the program must present evidence that they are capable of undertaking the coursework required of them. Such evidence must include familiarity, background, and/or interest in infrastructure and environmental issues.

Students may have completed equivalent courses elsewhere. Normally, transcripts provide the evidence required by the Program Committee. However, if the

student's previous experience is offered as evidence, the student must provide all the documentation necessary to specify such experience. Visit ines.charlotte.edu for other details.

Degree Requirements

The degree of Doctor of Philosophy in Infrastructure and Environmental Systems is awarded for completion of scholarly research that advances the knowledge base in the field of that research. Evidence of this is demonstrated by a successful dissertation defense. In addition, recipients of the degree should demonstrate a mastery of relevant subject matter and a potential for success in research and teaching.

The regular track of the INES Ph.D. program requires a minimum of 72 post-baccalaureate credit hours including 12 hours of Common Core Courses, 12 hours of Specialized Electives, 18 hours of dissertation research, 30 hours of Directed Studies, and the completion of GRAD 8302 and GRAD 8990. A master's degree in an appropriate field consistent with the admission requirements may count up to 30 credit hours of transfer credit to fulfill a portion or all of the Directed Studies requirement, upon recommendation of the Program Director and upon approval by the Graduate School.

For students admitted to the Advanced Standing Track, the minimum requirement of credit hours is reduced to 42 credit hours by completing Core Courses (12 credit hours), Specialized Electives (12 credit hours), Dissertation Research (18 credit hours), and GRAD 8302 and GRAD 8990. The requirement of Directed Studies (30 credit hours) will be waived.

All doctoral students are required to complete GRAD 8302 and GRAD 8990 for responsible conduct of research and academic integrity, respectively.

For Students with a Master's Degree (Advanced Standing Track):

Common Core Courses (12 credit hours)

Advanced Infrastructure Systems Course (3 credit hours)

INES 8104 - Advanced Infrastructure Systems (3)

Environmental Systems Course (3 credit hours)

INES 8101 - Environmental Systems (3)

Or one of the following courses as a substitute:

EMGT 6910 - Forecasting Techniques, Methodologies, and Practice (3)

GEOG 8220 - Human-Environment Interactions (3)

GEOG 8222 - Quaternary Paleoenvironmental Sciences (3)

GEOL 6102 - Earth Systems Analysis: Paleoenvironments (3)

INES 8120 - Numerical Modeling of the Earth System (3)

INES 8201 - Environmental and Ecological Economics (3)

INES 8202 - Renewable Energy (3)

An equivalent course not listed above with approval of the Program Director

Interdisciplinary Elective Course (3 credit hours)

Select one of the following:

ARCH 6050 - Architectural Elective (3)
 ECON 6112 - Graduate Econometrics (3)
 EMGT 6952 - Engineering Systems Optimization (3)
 GEOG 8223 - Landscape Assessment (4)
 GRAD 8104 - Spatial Statistics (3)
 INES 8202 - Renewable Energy (3)
 MBAD 6962 - Energy Markets (3)
 PPOL 8640 - Economic Analysis of Public Policy I (3)
 An equivalent course not listed above with approval of the Program Director

Seminar Course (3 credit hours)

Repeat the following seminar course each Fall semester for a total of 3 credit hours:

INES 8690 - Seminar (1)

Specialized Elective Courses (12 credit hours)

Select four doctoral-level courses from the following:
 INES 8000-8890 (excluding INES 8690)

Note: Non-INES doctoral-level courses may be substituted with approval of the Program Director.

Dissertation Research (18 credit hours)

INES 8999 - Doctoral Dissertation Research (1 to 9)
(maximum of 18 credit hours) (excluding INES 8998)

Degree Total beyond Master's Degree = 42 credit hours

For Students with a Bachelor's Degree or a Master's Degree Admitted to the Regular Track:

Common Core Courses (12 credit hours)

Advanced Infrastructure Systems Course (3 credit hours)

INES 8104 - Advanced Infrastructure Systems (3)

Environmental Systems Course (3 credit hours)

INES 8101 - Environmental Systems (3)

Or one of the following courses as a substitute:

EMGT 6910 - Forecasting Techniques, Methodologies, and Practice (3)
 GEOG 8220 - Human-Environment Interactions (3)
 GEOG 8222 - Quaternary Paleoenvironmental Sciences (3)
 GEOL 6102 - Earth Systems Analysis: Paleoenvironments (3)
 INES 8120 - Numerical Modeling of the Earth System (3)
 INES 8201 - Environmental and Ecological Economics (3)
 INES 8202 - Renewable Energy (3)

An equivalent course not listed above with approval of the Program Director

Interdisciplinary Elective Course (3 credit hours)

Select one of the following:

ARCH 6050 - Architectural Elective (3)
 ECON 6112 - Graduate Econometrics (3)
 EMGT 6952 - Engineering Systems Optimization (3)
 GEOG 8223 - Landscape Assessment (4)
 GRAD 8104 - Spatial Statistics (3)
 INES 8202 - Renewable Energy (3)
 MBAD 6962 - Energy Markets (3)
 PPOL 8640 - Economic Analysis of Public Policy I (3)
 An equivalent course not listed above with approval of the Program Director

Seminar Course (3 credit hours)

Repeat the following seminar course each Fall semester for a total of 3 credit hours:

INES 8690 - Seminar (1)

Specialized Elective Courses (12 credit hours)

Select four doctoral-level courses from the following:
 INES 8000-8890 (excluding INES 8690)

Note: Non-INES doctoral-level courses may be substituted with approval of the Program Director.

Directed Studies Courses (30 credit hours)

Select from the following:

INES 8090 - Topics in Infrastructure and Environmental Systems (3)
 INES 8890 - Doctoral Independent Study and Project (1 to 9) *(maximum of 9 credit hours)*
 Transfer of graduate credit hours *(maximum of 30)*
 ARCH 5000-8000
 BIOL 5000-8300
 CEGR 5000-8090
 CHEM 5000-8200
 ECON 5000-6902
 EGMT 5000-6980
 ESCI 5000-6900
 GEOG 5000-8800
 GEOL 5000-6800
 ITCS 5000-8500
 MEGR 5000-8900
 STAT 5000-8800

Dissertation Research (18 credit hours)

INES 8999 - Doctoral Dissertation Research (1-9)
(maximum of 18 credit hours) (excluding INES 8998)

Degree Total beyond Bachelor's Degree = 72 credit hours

Graduate Course Requirements

All courses taken for credit in the INES Ph.D. program shall be graduate level courses (6000/7000-level and 8000-level: graduate students only), and the majority shall be at the Ph.D. level (8000-level: Ph.D. students only). All designated INES 8000-level courses are open only to Ph.D.

students. No credit is given in the INES program for graduate coursework completed at the combined undergraduate-graduate level (5000-level at UNC Charlotte), except for Directed Studies.

Common Core Courses

INES Ph.D. students participate in interdisciplinary activities throughout their program of study. Students begin with a set of four common core courses that teach them about key aspects of infrastructure and environmental systems present in all applications of INES. These common aspects are reflected in four course offerings (two core courses, one interdisciplinary elective, and one continuous seminar). Students must complete INES 8104 in their first year of study and, throughout the program, students participate in interdisciplinary seminars.

Specialized Elective Courses

It is recognized that doctoral degree study requires advanced knowledge of issues, the breadth of which depends on the context and objectives of the academic program. Both the infrastructure and the environment involve broad and multi-faceted issues. Beyond the core, a student needs to support doctoral research with enrollment in particular courses related to their research. For this reason, a minimum of 12 credit hours have been reserved for specialized electives. The objective of these specialized electives is to provide an opportunity for students, their advisors, and their doctoral committee to select a complementary set of specialized courses intended to support the student's area of interest and research.

Specialized Elective courses come from many fields and sub-fields of various academic disciplines to address the program's focus of INES design, technology, science, and management. Many acceptable courses are offered in various departments at the master's level and Ph.D. levels. Selected courses must be approved by each student's advisor and doctoral committee.

Directed Studies

In recognition of varying backgrounds, preparation, interests, and goals, each student may complete additional graduate credits through directed studies (transfer credit, courses, research, or individual study), with the consent of their advisor and doctoral committee. This category may include courses within a student's specialized area as well as courses outside the specialized area. Within the directed studies category, a student may complete a maximum of 9 credit hours of independent study toward the Ph.D. degree.

Dissertation Requirement

The INES doctoral program includes a maximum of 18 credit hours of dissertation credit (INES 8999). The number of research credits taken each semester must be

approved by the student's advisor and doctoral committee. If more than 18 credit hours of dissertation credit are needed, students should register for INES 8998.

Each student must complete and defend a dissertation based on a research program approved by the student's doctoral committee. The dissertation must be of high quality and represent an original piece of research that advances the body of knowledge in infrastructure and environmental systems. Oral presentation and successful defense of the dissertation before the student's doctoral committee in a forum open to the public is required.

A copy of the student's dissertation is made available to the graduate faculty of the program at least two weeks prior to the public defense. The dissertation must be written in a format acceptable to the Graduate School and shall satisfy all requirements and deadlines specified by the Graduate School. Students are strongly encouraged to publish in a refereed journal before graduation.

Advising

Upon acceptance into the INES Ph.D. program, a student is assigned an interim advisor by the Program Director. Within the first year in the program, each student selects a permanent doctoral research advisor. This selection is approved by the Program Director and Dean of the Graduate School. At any time, a student may request a change of initial supervisor or research advisor. These requests are submitted to the Program Director for consideration and action.

Plan of Study

Students who enter the Ph.D. Program must prepare a plan of study before the end of their second semester in the Program. The plan of study proposes a schedule for completion of all coursework by the student. Each plan is approved by the student's doctoral committee and the Program Director. Students are encouraged to monitor their study progress through DegreeWorks.

Qualifying Examination

Each student must complete a pre-qualifying examination, a qualifying examination and an oral defense of their research proposal. The written pre-qualifying examination is based solely on INES 8104. The written qualifying examination includes specialized elective courses and research areas selected by the student's advisor and the doctoral committee. This qualifying examination is administered by the student's doctoral committee. The oral defense of the research proposal is also administered by the student's doctoral committee and requires a presentation and defense by the student of their proposed research topic.

Students who enter the Ph.D. program directly from a baccalaureate program generally sit for the two written

examinations before the end of their third post-baccalaureate year in the program; students who enter from a master's degree program must sit for the written examinations before the end of their second year in the program. To sit for these examinations, a student must have at least a 3.00 GPA and must have removed all deficiencies upon admission.

A student may attempt to pass each of these examinations and the oral defense no more than twice. Failure of any of these examinations and the oral defense a second time results in termination of enrollment in the Ph.D. program.

Doctoral Committee

Each student's Doctoral Committee comprises five members including a UNC Charlotte Graduate Faculty who acts as the Doctoral Research Advisor, three regular faculty members, and a Graduate Faculty Representative. The Doctoral Research Advisor shall chair the Doctoral Committee and works with the student to recommend the appointment of three regular members and may suggest another faculty to be the Graduate Faculty Representative or they may let the Graduate School to select the Representative. The entire committee shall be approved by the Program Director, with subsequent concurrence by the Dean of the Graduate School. Faculty serving as regular members should have expertise in the student's area of research. The Graduate Faculty Representative may or may not have expertise in the student's area of research.

The Doctoral Committee must be formed no later than the third semester of enrollment into the INES program. At least three of the Doctoral Committee members must be INES Program Faculty members. At least one of the four members must come from a different academic discipline, in order to reflect the interdisciplinary nature of the program. The inclusion of one member from outside UNC Charlotte is strongly encouraged, and this person must be eligible for appointment as an affiliated member of the UNC Charlotte Graduate Faculty.

Admission to Candidacy

After passing the qualifying examination, a student can propose a dissertation topic. A student advances to candidacy after the dissertation topic has been approved by the student's doctoral committee. Candidacy must be achieved at least 6 months before the degree is conferred. Students are encouraged to track their study progress toward degree requirements through DegreeWorks.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in

the University Academic Calendar.

Research Opportunities

INES faculty members reside in the Departments of Civil and Environmental Engineering, Geography and Earth Sciences, Construction Management and Engineering Technology, Biological Sciences, Chemistry, Economics, Finance, and Industrial and Systems Engineering, as well as the School of Architecture. INES faculty members in these departments (and school) currently conduct research in their specialized areas of interest as well as in interdisciplinary areas (see current areas of research listed at the beginning of this catalog section). Several international universities collaborate with INES to implement joint supervision of doctoral research.

Other Requirements

Requirements for grades, transfer credits, residency, and time limits for completion match those described generally for the University. Various forms must be submitted to the Graduate School at various times by each INES student. Those forms include: Application for Transfer of Credit into a Graduate Degree Program, Appointment of Doctoral Committee, Qualifying Examination Report, Application for Candidacy, Application for Degree, Dissertation Defense Report for Doctoral Candidates, and Dissertation Submission and ETD Form. Refer to the appropriate sections of this *Catalog* and to the INES and Graduate School websites for details.

Financial Support

The INES program offers financial support in the form of assistantships and tuition grants as described below.

Assistantships

Research and teaching assistantships are available from the INES program on a competitive basis to qualified applicants/students.

Tuition Grants

The Graduate School provides some tuition support via a plan called GASP. Visit graduateschool.charlotte.edu/faculty-and-staff-resources/policies for details.

MECHANICAL ENGINEERING

- **Ph.D. in Mechanical Engineering**
- **M.S. in Mechanical Engineering (MSME)**
 - o Dynamics and Control
 - o Machine Learning in Mechanical Engineering
 - o Metrology and Manufacturing
 - o Motorsports and Automotive Engineering
 - o Solid Mechanics and Materials Science
 - o Thermal Science and Fluid Mechanics
 - o Interdisciplinary Biomedical Engineering
- **Graduate Certificate in Precision Metrology**

**Department of Mechanical Engineering
and Engineering Science**

mees.charlotte.edu

Ph.D. in Mechanical Engineering

The Department of Mechanical Engineering and Engineering Science offers multi-disciplinary programs leading to a Ph.D. in Mechanical Engineering degree in the areas of automotive engineering, biomedical engineering, computational modeling and simulation, materials science, manufacturing, and precision engineering. In addition, the Ph.D. in Mechanical Engineering program offers an Advanced Standing Option for students who have already earned a Master's degree in selected disciplines.

The objectives of the Ph.D. program are:

- To provide students with the opportunity to develop a breadth of knowledge in mechanical engineering so that they can adapt to the changing requirements of the technological workplace.
- To develop engineering researchers who can contribute to the development of new knowledge and the dissemination of best practices in academic, industrial, and government environments.
- To prepare graduates for personal and professional success, both as individuals and in team environments.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for study toward the Ph.D. program in Mechanical Engineering:

- 1) A master's degree in engineering or a closely allied field with a GPA of at least 3.5. Exceptional students

with only a baccalaureate degree may also be considered for admission to the Ph.D. program.

- 2) The applicant must receive a satisfactory Graduate Record Examination (GRE) General Test score.
- 3) Three letters of reference, at least two of which must be from faculty members. All three must be from professionals working in the applicant's field of interest.

Acceptability for admission is based upon the applicant's record and background as determined by the department.

GRE Waiver

The GRE requirement will be waived for the following applicants:

- Current UNC Charlotte undergraduate students who have earned a minimum 3.2 cumulative GPA and completed at least 75 earned credit hours
- Applicants who have earned a bachelor's degree with a minimum cumulative undergraduate GPA of 3.2 from an ABET-accredited program in a U.S. institution
- Applicants who have passed the FE exam and/or earned the PE license
- Applicants who have completed a master's degree in engineering or related fields, and earned a minimum graduate GPA of 3.5 from an ABET-accredited program in a U.S. institution

Application Deadline

Application deadlines are in accordance with UNC Charlotte Graduate School deadlines. However, to ensure full consideration for financial support, applications must be received by September 1 for Spring admission and February 1 for Fall admission.

Degree Requirements

- 1) Appointment of a Ph.D. advisor and formation of an advisory committee.
- 2) Development of a Ph.D. Plan of Study detailing all course and examination requirements.
- 3) Successful completion of the written qualifying examination.
- 4) Formation of a Dissertation Committee, presentation of a proposal for Ph.D. research, and admission to candidacy.
- 5) Successful defense of the Ph.D. Dissertation.

Within the first semester of being admitted into a Ph.D. program, the student should choose a Ph.D. advisor and form an advisory committee, consisting of the Ph.D. advisor, Associate Chair for Graduate Programs, and academic advisor. In conjunction with the advisory committee, the student will develop a Plan of Study to meet the Ph.D. program requirements of coursework and examinations and prepare to undertake original research leading to a dissertation of a quality that would be

acceptable for publication of articles in peer-refereed professional journals.

Plan of Study

The Plan of Study must show at least 72 credit hours beyond the baccalaureate degree, including 45 credit hours of graduate coursework (6000-level or above), and 27 credit hours of dissertation research. All doctoral students must register for 8000-level courses when they are available. 5000-, 6000-, or 7000-level courses that do not have 8000-level counterparts may also be counted towards the doctoral degree if approved by the advisory committee. For students who do not possess appropriate bachelor's and/or master's degrees in engineering, additional coursework is expected. The specific course requirements are set by the student's advisory committee but must include: at least 6 credit hours of graduate mathematics (e.g., MEGR 8172, MEGR 8174, or MEGR 8175) and at least 18 credit hours of MEGR courses. Graduate courses from outside the department may be taken, but must be approved by the Associate Chair for Graduate Programs as part of the student's Plan of Study. Students are pre-approved to choose one of the following Graduate School courses: GRAD 8201, GRAD 8202, GRAD 8210, or GRAD 8212. The Plan of Study must be submitted to the department for review and approval no later than the second semester after admission to the Ph.D. program. All coursework must be completed within nine years from admission to the program.

Research Seminar

All Ph.D. students are required to register for MEGR 8000 each semester through completion of proposal defense. This 1 credit hour course is graded on a pass/unsatisfactory basis, and does not count toward the required 72 degree hours.

MEGR 8000 - Research Seminar (1)

Responsible Conduct of Research and Academic Integrity Courses

All Ph.D. students are required to complete GRAD 8990 in the first semester, and GRAD 8302 in the first or second semester. GRAD 8990 is a no credit and non-graded course. GRAD 8302 is a 2 credit hour course, graded on a pass/unsatisfactory basis, and does not count toward the required 72 degree hours.

GRAD 8302 - Responsible Conduct of Research (2)

GRAD 8990 - Academic Integrity (0)

Degree Total = 72 Credit Hours

Grade Requirements

A student is expected to achieve grades of A or B in all coursework taken for graduate credit and must have a minimum GPA of 3.0 in order to graduate. An

accumulation of two marginal C grades will result in suspension from the program, and a single grade of U in any course will result in termination.

The dissertation research is graded on a SP (satisfactory progress) or UP (unsatisfactory progress) basis and, therefore, will not be included in the cumulative average. The second time in which a grade of UP is earned will trigger a discussion between the student and Ph.D. advisor about lack of progress in the program. This discussion will include all possible recommendations from the Ph.D. advisor, such as pursuing a new topic, moving to a new advisor or even termination from the program. The advisor will discuss any recommendation to terminate a student for lack of progress with the Associate Chair for Graduate Programs prior to forwarding such a request to the Graduate School for consideration.

A graduate student whose enrollment has been terminated because of grades is ineligible to attend any semester or summer session unless properly readmitted to the graduate program. Readmission to the program requires approval of the Dean of the Graduate School upon the recommendation of the student's major department and the Engineering Doctoral Graduate Committee of the College of Engineering.

Residence Requirement

A student may satisfy the residency requirement for the program by completing 18 credit hours, either coursework or research credits, by study-in-residence during the academic year and during the summer terms, as long as the study is continuous. Study-in-residence is deemed to be continuous if the student is enrolled in one or more courses (including research/dissertation credit) in successive semesters until 18 credit hours are earned.

Qualifying Examinations

After completing two semesters in the Ph.D. program, students take qualifying exams in math and two topical areas, selected by the student and their Ph.D. advisor. The mathematics examination is based on content from the course, Engineering Analysis (this course is currently offered as MEGR 8174). Students must obtain 70% or above on the mathematics exam to pass.

The student and the Ph.D. advisor select the two areas for the topical exams. 70% or above is the passing grade in each of the two topic areas.

For each of the three exams, two outcomes are possible: Pass (70% or more) or Fail (69% or less). If the student fails any or all of the exams in the first attempt, they are either allowed to retake the failed exam(s) or terminated from the program. If the student fails any exam for the second time, this is sufficient grounds for termination from the program.

Dissertation

Dissertation Committee

After passing the qualifying exam, students should set up a Dissertation Committee of at least four graduate faculty members. Two of these four members shall be from a department other than the student's major. The Dissertation Committee must include a chair and a Graduate Faculty Representative. The Ph.D. advisor serves as the chair of the Dissertation Committee. They can be a regular member of the Department of Mechanical Engineering and Engineering Science (MEES) graduate faculty or an affiliated faculty member. When an affiliated faculty member serves as the chair, a regular MEES faculty member must be appointed as the co-chair. No more than one affiliated faculty member can serve on the committee. This also means at least two committee members must be regular MEES graduate faculty. The Graduate Faculty Representative is appointed by the Graduate School to ensure that the composition of the committee is appropriate. Committee members from outside the University must be appointed Associate Graduate Faculty members at UNC Charlotte. The Dissertation Committee shall be chosen by the student in consultation with their Ph.D. advisor. The Dissertation Committee must be approved by the Associate Chair for Graduate Programs. If there is need to change committee members later, a revised Committee form must be approved and submitted to the Graduate School.

Proposal Defense

Each student must present and defend a Ph.D. dissertation proposal after passing the qualifying exam, following the technical guidelines established by the department. The proposal defense is conducted by the student's Dissertation Committee and is open to MEES faculty and students. The student shall provide copies of the written proposal to the Committee members at least two weeks before the scheduled defense.

It is expected that the student makes the proposal defense within two semesters after the Qualifying Exam is passed; exceptions will be made at the discretion of the student's advisor with approval of the Associate Chair for Graduate Programs.

Ph.D. Candidacy

A doctoral student advances to Ph.D. candidacy after the dissertation proposal has been successfully defended.

Once the student has been admitted to candidacy, a tentative date for the dissertation defense should be agreed upon by the candidate and dissertation committee chair. The date should be realistic and allow ample time for completion and review of the dissertation.

Dissertation Defense

Evidence of a high degree of competence in scholarship, written exposition, independent inquiry, and the ability to organize and apply knowledge must be demonstrated by the student in the dissertation. The student makes a public defense of the dissertation at which time the dissertation, as well as the student's knowledge of the field, is appropriate matter for examination by the student's advisory committee. The date of the defense must be publicly announced at least two weeks prior to the defense. Although questions may be asked by the general audience, evaluation of the dissertation defense is the sole responsibility of the advisory committee. The dissertation defense is graded on a Pass/Fail basis.

Progress Report and Evaluation

In January of every year, each student is required to submit a written progress report for the previous year, and the advisor(s) is required to submit a written evaluation of the student to the Associate Chair for Graduate Programs. A rubric is used for evaluation of progress. Failure to make satisfactory progress may result in discontinuation of the student's graduate assistantship and suspension from the program.

Advanced Standing Option

Admission Requirements

To be admitted into the Advanced Standing Option for the Ph.D. in Mechanical Engineering program, students must meet all the admission requirements of the Ph.D. above AND must have earned a master's degree in engineering or closely related fields (e.g., physics, computational mechanics). Only students who have earned a master's degree in these areas will be considered, no exceptions will be made. All other students should apply to the Ph.D. program above (without the Advanced Standing Option).

Additionally, students with a cumulative GPA less than 3.2 in their master's degree or more than 2 grades of C in their master's degree courses are not eligible for Advanced Standing Option. In this case, students have the option of requesting transfer of credit hours for individual courses with grades of B or above.

Degree Requirements

The degree requirements for the Advanced Standing Option are similar to the Ph.D. in Mechanical Engineering above except that students complete only 42 credit hours. No transfer credits are allowed under this program. The degree requirement is as follows:

- 21 credit hours minimum graduate coursework, of which at least 12 credit hours must be MEGR courses
- Students who have not satisfied the mathematics requirement (6 credit hours minimum) as part of their

master's degree must complete that requirement as part of the coursework at UNC Charlotte (e.g., MEGR 8172, MEGR 8174, or MEGR 8175)

- MEGR 8999 - Doctoral Dissertation Research (21 credit hours minimum)
- All Ph.D. students are required to register for MEGR 8000 each semester through completion of proposal defense/eligibility to enroll in GRAD 9800 (a non-graded course but can satisfy the full-time enrollment requirement)
- All students are required to complete GRAD 8990 in the first semester, and GRAD 8302 in the first or second semester

A minimum of 42 credit hours are required to complete the degree under the Advanced Standing Option. Once the minimums stated above are satisfied, the remaining hours, if any, can be satisfied via elective coursework or research credit hours (MEGR 8999). Any courses outside the Department of Mechanical Engineering and Engineering Science requires departmental approval.

Qualifying Examination

Students who enter the Ph.D. program under the Advanced Standing Option must take the qualifying examination before the end of their third semester in the doctoral program.

M.S. in Mechanical Engineering

The Department of Mechanical Engineering and Engineering Science offers programs of study and research leading to the Master of Science in Mechanical Engineering (M.S.M.E.) and the Master of Science in Engineering (M.S.E.). The M.S.M.E program of study is for students who have completed a B.S.M.E. degree while the M.S.E. degree is for students who may not possess a baccalaureate degree in engineering.

The objectives of the M.S.M.E and M.S.E. program are:

- To provide our students with the opportunity to develop a breadth of knowledge in mechanical engineering so that they can adapt to the changing requirements of the technological workplace.
- To produce graduates who are able to practice as mechanical engineers with advanced skills and serve state, regional, and national industries.
- To prepare graduates for personal and professional success, both as individuals and in team environments

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Department of Mechanical Engineering and Engineering Science (MEES) seeks the

following from applicants to the Master's program in Mechanical Engineering:

- An earned undergraduate degree in Mechanical Engineering (B.S.M.E.) or a closely related field of engineering or sciences
 - Applicants with baccalaureate degrees in fields other than Mechanical Engineering (e.g., engineering technology, physics, mathematics, chemistry, etc.) are required to take additional post-baccalaureate courses to supplement the undergraduate curriculum and ensure success in graduate coursework and research. Remediation of certain deficiencies as specified by the department for each area of concentration. Such courses should be taken before applying for the M.S.M.E.
- A minimum undergraduate GPA of 3.0 on a 4.0 scale
- A satisfactory Graduate Record Examination (GRE) general test score
- Three letters of recommendation, at least one of which must be from faculty members. All three must be from professionals working in the applicant's field of interest.
- An acceptable TOEFL, IELTS, or Duolingo score as required by UNC Charlotte for international students

GRE Waiver

The GRE requirement will be waived for the following applicants:

- Current UNC Charlotte undergraduate students who have earned a minimum cumulative GPA of 3.2 and completed at least 75 earned credit hours
- Applicants who have earned a bachelor's degree with a minimum cumulative undergraduate GPA of 3.2 from an ABET-accredited program in a U.S. institution
- Applicants who have passed the FE exam and/or earned the PE license
- Applicants who have completed a master's degree in engineering or related fields, and earned a graduate GPA of 3.5 or higher from an ABET-accredited program in a U.S. institution

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

A total of 30 credit hours of approved graduate coursework are required. Students select one of the two

following options after completing no more than 18 credit hours.

Option A: Thesis

Successful completion of 24 credit hours of graduate-level coursework and 6 credit hours of thesis research.

Coursework (24 credit hours)

Mathematics Courses (6 credit hours)

Select two of the following:

MEGR 7172 - Computational Methods in Engineering (3)

MEGR 7174 - Engineering Analysis I (3)

MEGR 7175 - Engineering Analysis II (3)

Concentration Courses (12 credit hours)

Complete 12 credit hours from one of the concentrations listed under Option B.

Elective Courses (6 credit hours)

Select 6 credit hours of Elective Courses from the list below under Option B. If more than 6 credit hours of elective courses are proposed to be taken from outside the Department of Mechanical Engineering and Engineering Science, approval from the Associate Chair for Graduate Programs is required.

Thesis (6 credit hours)

6 credit hours of thesis research is required.

MEGR 7991 - Graduate Master Thesis Research (1 to 6)

Plan of Study

Students must meet with their thesis advisor to formulate a plan of study and establish a thesis committee. The plan of study must be submitted after completing no more than 18 credit hours.

Thesis Committee

The student must establish a thesis committee that is composed of at least 3 members of the graduate faculty, with up to one member from outside the Department of Mechanical Engineering and Engineering Science. The faculty thesis advisor serves as the chairperson of the committee.

Admission to Candidacy

Students must hold a proposal defense for approval of their thesis topic (the proposal defense format is left to the discretion of the advisor).

Thesis Defense

A copy of the thesis should be distributed to each member of the program committee at least two weeks prior to the defense. Students should make a public announcement two weeks before the defense within the department to allow attendance by interested faculty members and students.

Option B: Non-Thesis/Project

Successful completion of 30 credit hours of graduate-level coursework.

Mathematics Courses (6 credit hours)

Select two of the following:

MEGR 7172 - Computational Methods in Engineering (3)

MEGR 7174 - Engineering Analysis I (3)

MEGR 7175 - Engineering Analysis II (3)

Concentration Courses (12 credit hours)

Declare a concentration and take 12 credit hours of courses listed in that concentration:

Battery Engineering Concentration

Select four of the following:

MEGR 5290 - Introduction to Electric Vehicles and Batteries (3)

MEGR 5291 - Battery Performance and Testing (3)

MEGR 5292 - Materials Science in Battery Technology (3)

MEGR 7099 - Special Topics in Battery Engineering (3)

MEGR 7290 - Battery Electrochemistry (3)

MEGR 7291 - Battery Management and Control (3)

Dynamics and Control Concentration

Select four of the following:

MEGR 5143 - Mechanical Vibrating Systems (3)

MEGR 5237 - Introduction to Control Systems (3)

MEGR 7145 - Advanced Topics in Dynamics (3)

MEGR 7222 - Mechatronics (3)

MEGR 7223 - Mathematical Concepts for Dynamics and Control (3)

MEGR 7224 - Analytical Mechanics (3)

MEGR 7225 - Linear Systems Theory (3)

MEGR 7226 - Optimal Control Theory (3)

Machine Learning in Mechanical Engineering Concentration

The Machine Learning in Mechanical Engineering concentration consists of foundational courses offered by other departments (i.e., non-MEGR courses), and discipline-specific courses offered by the MEES department (i.e., MEGR courses). Currently, the discipline-specific courses are offered as special topics courses each semester. In consultation with the academic advisor or Associate Chair for Graduate Programs, select two MEGR discipline specific courses and two non-MEGR foundational courses from the following:

MEGR 7090 - Special Topics in Mechanical Engineering (3)

MEGR 7090 - Special Topics in Mechanical Engineering (3)

EMGT 6113 - Cluster Analysis and Applications (3)

EMGT 6912 - Computational Intelligence (3)

EMGT 6952 - Engineering Systems Optimization (3)

ITCS 5111 - Introduction to Natural Language Processing (3)

ITCS 6156 - Machine Learning (3)

Metrology and Manufacturing Concentration*Select four of the following:*

- MEGR 5280 - Advanced Manufacturing Processes (3)
- MEGR 6181 - Engineering Metrology (3)
- MEGR 7182 - Machine Tool Metrology (3)
- MEGR 7191 - Introduction to Optical Fabrication and Testing (3)
- MEGR 7283 - Advanced Coordinate Metrology (3)
- MEGR 7284 - Advanced Surface Metrology (3)

Motorsports and Automotive Engineering Concentration*Select four of the following:*

- MEGR 5210 - Automotive Powerplants (3)
- MEGR 5211 - Road Vehicle Dynamics (3)
- MEGR 5240 - Advanced Automotive Powerplants (3)
- MEGR 5242 - Applied Vehicle Aerodynamics (3)
- MEGR 5244 - Tire Mechanics (3)
- MEGR 7136 - Automotive Materials (3)
- MEGR 7214 - Turbulent Shear Flows (3)
- MEGR 7215 - Turbulence Modeling and Simulations (3)

Solid Mechanics and Materials Science Concentration*Select four of the following:*

- MEGR 6141 - Theory of Elasticity I (3)
- MEGR 6166 - Mechanical Behavior of Materials I (3)
- MEGR 7108 - Finite Element Analysis and Applications (3)
- MEGR 7163 - Materials Characterization and Analysis (3)
- MEGR 7170 - Fracture Mechanics (3)
- MEGR 7171 - Phase Transformation in Solids (3)
- MEGR 7172 - Computational Methods in Engineering (3)
- MEGR 7173 - Engineering Design Optimization (3)

Thermal Science and Fluid Mechanics Concentration*Select four of the following:*

- MEGR 7113 - Dynamics and Thermodynamics of Compressible Flow (3)
- MEGR 7114 - Advanced Fluid Mechanics (3)
- MEGR 7117 - Statistical Thermodynamics (3)
- MEGR 7213 - Introduction to Computational Fluid Dynamics (3)
- MEGR 7214 - Turbulent Shear Flows (3)
- MEGR 7215 - Turbulence Modeling and Simulations (3)

Interdisciplinary Biomedical Engineering Concentration*In consultation with the academic advisor or Associate Chair for Graduate Programs, select four courses from different concentrations and courses listed below.*

- MEGR 5271 - Orthopedic Biomechanics (3)
- MEGR 5272 - Mechanics of the Human Locomotor System (3)
- MEGR 5273 - Regenerative Neural Engineering (3)
- MEGR 5274 - Bioelectronic Medicine (3)
- MEGR 7119 - Thermal Applications in Biomedical Engineering (3)

Dual Concentration

Students may request to complete two concentrations. However, an additional 12 credit hours are required with no course double-counting toward two concentrations.

Elective Courses (9 credit hours)

Select three of the following. No more than 6 credit hours may be taken from outside the Department of Mechanical Engineering and Engineering Science. No more than 6 credit hours may be in Individual Study.

- Any MEGR 5000, 6000, or 7000-level course
- ECGR 6111 - Linear Systems Theory (3)
- ECGR 6115 - Optimal Control Theory (3)
- AEEE 6120 - Energy Generation and Conversion (3)
- EMGT 6924 - Lean Six Sigma Practice and Management (3)
- NANO 8102 - Nanoscale Phenomena (3)
- NANO 8104 - Fabrication of Nanomaterials (3)
- NANO 8301 - Nanomedicine (3)
- NANO 8351 - Nanoscale Materials for Energy Applications (3)
- NANO 8354 - Solar Applications of Nanomaterials (3)
- OPTI 5371 - Waves and Optics (3)
- OPTI 6206 - Physical Optics Design and Simulation (3)
- OPTI 6241 - Optical System Function and Design (3)

Capstone Course (3 credit hours)

A capstone course has a class project component. No capstone course can be double-counted to also satisfy a Concentration or Elective Course requirement. With prior approval from the Associate Chair for Graduate Programs, an offering of MEGR 7892 that includes a project may be approved to count as the required capstone course.

Select one of the following:

- MEGR 7108 - Finite Element Analysis and Applications (3)
- MEGR 7172 - Computational Methods in Engineering (3)
- MEGR 7173 - Engineering Design Optimization (3)
- MEGR 7186 - Data Analysis and Uncertainty (3)
- MEGR 7213 - Introduction to Computational Fluid Dynamics (3)
- MEGR 7214 - Turbulent Shear Flows (3)
- MEGR 7215 - Turbulence Modeling and Simulations (3)
- MEGR 7222 - Mechatronics (3)
- MEGR 7284 - Advanced Surface Metrology (3)

Plan of Study

Students must formulate and submit a plan of study. The plan of study must be submitted after completing no more than 18 credit hours.

Degree Total = 30 Credit Hours***Grade Requirements/Academic Standards***

Only grades of A, B, or C are accepted towards a graduate degree. A grade of U in any graduate course

will suspend the student's enrollment subject to readmission as prescribed in the *Graduate Catalog*. Similarly, an accumulation of three C grades will result in suspension of the student's enrollment, subject to readmission to a program. A student in any graduate program is required to maintain satisfactory progress toward the degree. Continued enrollment is at all times subject to review on the basis of academic record and actions with regard to observance of University rules and regulations.

Application for Degree

Students preparing to graduate must submit an online Application for Degree by the filing data specified in the University Academic Calendar. If a student does not graduate in the semester identified on the Application for Degree, then the student must submit a new Application for Degree for graduation in a subsequent semester.

Assistantships

Financial assistance for qualified students is available on a competitive basis in the form of graduate teaching and research assistantships. All M.S. students who entered "Yes" in the application form on the question "Assistantship Interest" are automatically considered. No separate assistantship application is required.

Transfer Credit

At the time of admission, up to six hours of transfer credit may be accepted from an ABET-accredited engineering institution. Transfer courses are considered as Elective Courses unless a direct replacement of a Core Course is warranted.

Graduate Certificate in Precision Metrology

The Graduate Certificate in Precision Metrology provides graduate students and professionals with the opportunity to reach a demonstrated level of competence in dimensional metrology theory and application beyond the undergraduate level and "bench experience."

Students are introduced to topics directly related to dimensional metrology and its application in industrial settings. Together, these advanced course topics provide students with broader knowledge of the field of metrology and exposure to advanced techniques in dimensional measurement and analysis of data.

The graduate certificate may act as a standalone graduate option for post-baccalaureate and post-master's students, or may be pursued concurrently with a related graduate degree program at UNC Charlotte. The 12 credit hours in the graduate certificate may be applied toward the M.S. in

Mechanical Engineering with approval of the Graduate Program Director.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the Department of Mechanical Engineering and Engineering Science seeks the following:

- 1) Either:
 - a) A bachelor's degree in engineering or a closely related technical or scientific field, or
 - b) Undergraduate coursework that includes engineering fundamentals (e.g., solids, statics, and dynamics)
- 2) A GPA of 3.0 (out of 4.0)
- 3) Applicants should submit written description of any relevant and significant work experience, especially as it pertains to metrology
- 4) Applicants whose native language is not English need to satisfy the UNC Charlotte Graduate School's English proficiency requirements

Certificate Requirements

The certificate is awarded upon completion of four graduate level courses (12 credit hours) in the area of metrology. Requests for related course substitutions may be approved at the discretion of the Graduate Program Director.

Required Courses (6 credit hours)

MEGR 6181 - Engineering Metrology (3)
MEGR 7182 - Machine Tool Metrology (3)

Students also enrolled in a Ph.D. program should substitute the following:

MEGR 8181 - Engineering Metrology (3)
MEGR 8182 - Machine Tool Metrology (3)

Elective Courses (6 credit hours)

Select two of the following:

MEGR 7183 - Design of Precision Machines and Instruments I (3)
MEGR 7185 - Gear Manufacturing and Metrology (3)
MEGR 7186 - Data Analysis and Uncertainty (3)
MEGR 7187 - Flexures (3)
MEGR 7191 - Introduction to Optical Fabrication and Testing (3)
MEGR 7283 - Advanced Coordinate Metrology (3)
MEGR 7284 - Advanced Surface Metrology (3)

Note: Students also enrolled in a Ph.D. program should substitute the following 8000-level equivalent courses:

MEGR 8183 - Design of Precision Machines and Instruments I (3)
MEGR 8185 - Gear Manufacturing and Metrology (3)
MEGR 8186 - Data Analysis and Uncertainty (3)
MEGR 8187 - Flexures (3)

MEGR 8191 - Introduction to Optical Fabrication and Testing (3)
MEGR 8283 - Advanced Coordinate Metrology (3)
MEGR 8284 - Advanced Surface Metrology (3)

Certificate Total = 12 Credit Hours

Transfer Credit

If any of the above courses are taken prior to admission to the certificate program, the student may, with the recommendation of their advisor and the approval of the Graduate School, apply a maximum of 6 graduate credit hours acceptably completed toward the certificate.

Grade Requirements

The cumulative GPA must be at least 3.0 and at most one course with a grade of C may be allowed toward the certificate.



College of Health and Human Services

health.charlotte.edu

In the College of Health and Human Services at the University of North Carolina at Charlotte, students and faculty help chart the course for healthcare and social services throughout the region. With excellence in educational programs, research, community service, and clinical practice, the college plays an important role in developing and implementing high quality healthcare and social service practices. As an interdisciplinary college, many opportunities exist for student and faculty collaboration in teaching and research. Within the college's diverse graduate curricula, faculty and student research also is a key component to successful student-learning outcomes. Additionally, the college incorporates information technology standards in all courses and offers online learning opportunities in many of its graduate programs.

In addition to program-specific special accreditations maintained by all of the College's graduate programs, the College as a whole is an applicant for school-level accreditation by the Council on Education for Public Health. As part of this school-level accreditation, students in all programs housed within the College's academic units will receive foundation public health training prior to graduation.

Graduate Degree Programs

- Doctor of Nursing Practice: Post-Master's
- Doctor of Nursing Practice: Nurse Anesthesia Across the Lifespan
- Doctor of Philosophy in Epidemiology
- Doctor of Philosophy in Public Health Sciences
- Master of Health Administration (MHA)
- MHA/MBA Dual Degree (*see Belk College of Business section*)
- Master of Science in Athletic Training
- Master of Science in Kinesiology
- Master of Science in Nursing: Adult-Gerontology Acute Care Nurse Practitioner
- Master of Science in Nursing: Community/Public Health Nursing
- Master of Science in Nursing: Family Nurse Practitioner Across the Lifespan
- Master of Science in Nursing: Nurse Administrator
- Master of Science in Nursing: Nurse Educator
- Master of Public Health (MPH)
- MPH/M.A. in Anthropology Dual Degree
- Master of Science in Health Informatics and Analytics (*see the "School of Data Science" section of this Catalog*)
- MHA/M.S. in Health Informatics and Analytics Dual Degree

- MPH/M.S. in Health Informatics and Analytics Dual Degree
- Master of Science in Respiratory Care
- Master of Social Work

Graduate Non-Degree Programs

- Graduate Certificate in Applied Nursing Informatics
- Graduate Certificate in Early Childhood Mental Health (*see College of Education section*)
- Graduate Certificate in Gerontology (*See College of Humanities & Earth and Social Sciences section*)
- Graduate Certificate in Health Informatics and Analytics (*see the "School of Data Science" section of this Catalog*)
- Graduate Certificate in Nursing Administration
- Graduate Certificate in Nursing Education
- Graduate Certificate in Respiratory Care Clinical Concepts
- Graduate Certificate in Respiratory Care Leadership
- Post-Master's Certificate in Adult-Gerontology Acute Care Nurse Practitioner
- Post-Master's Certificate in Family Nurse Practitioner Across the Lifespan

Accreditation

See the "Academic Programs" section of this Catalog for details about program accreditation.

APPLIED PHYSIOLOGY, HEALTH, AND CLINICAL SCIENCES

- MPH in Physical Activity and Nutrition [*See Master of Public Health (MPH) program*]
- M.S. in Athletic Training
- M.S. in Kinesiology
 - Applied Physiology
 - Clinical Exercise Physiology
 - Strength and Conditioning
- M.S. in Respiratory Care
 - Advanced Respiratory Care Practice
- Graduate Certificate in Respiratory Care Clinical Concepts
- Graduate Certificate in Respiratory Care Leadership

Department of Applied Physiology, Health, and Clinical Sciences

aphcs.charlotte.edu

Master of Science in Athletic Training

The M.S. in Athletic Training prepares students for national certification and licensure as a certified athletic trainer with career opportunities in high schools, colleges/universities, orthopedic and sports medicine clinics, business and industry, professional sports teams, government health agencies, branches of the U.S. military, and research laboratories.

The emphases of the curriculum are: evidence based practice, risk management and injury prevention, pathology of injuries and illnesses, acute care of injuries and illnesses, pharmacology, therapeutic modalities, therapeutic exercise, general medical conditions and disabilities, nutritional aspects of injuries and illnesses, psychosocial intervention and referral, healthcare administration, and professional development and responsibilities. Students are given opportunities to gain knowledge and skills needed to pass the certification exam of the Board of Certification (BOC) for Athletic Training.

Admission Requirements

In addition to fulfilling the University's general requirements for graduate admission at the Master's level, applicants seeking admission to the MSAT program must also have:

- 1) Overall undergraduate cumulative GPA of 3.0 (on a 4.0 scale) in all college coursework
- 2) Grades of C or above in the following prerequisite courses:
 - a) Human Anatomy with laboratory
 - b) Human Physiology with laboratory
 - c) Chemistry with laboratory
 - d) Physics with laboratory
 - e) Statistics
 - f) Exercise Physiology
 - g) Psychology
 - h) Nutrition
 - i) Biomechanics
 - j) Medical Terminology
 - k) Introduction to Biology
- 3) 50 hours of observation shadowing a certified athletic trainer
- 4) For non-native English language speakers: Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS)
- 5) Statement of Purpose; 500 to 1000 words describing the applicant's educational goals and expectations of the program

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

Successful completion of the program requires a total of 58 credit hours of coursework (21 courses). All students participate in clinical rotations. These clinical rotations are assigned to the students based on required competencies and proficiencies for accreditation purposes. There are skills assessed during these clinical rotations that follow the didactic course in which they are instructed. These are requirements of accreditation by the Commission on Accreditation of Athletic Training Education (CAATE).

ATRN 6100 - Acute and Emergency Care in Athletic Healthcare (3)

ATRN 6101 - Clinical Anatomy for Allied Health (3)

ATRN 6102 - Fundamentals in Athletic Training (3)

ATRN 6103 - Introduction to Clinical Care (1)

ATRN 6104 - Clinical Evaluation and Diagnosis of the Lower Extremity (3)

ATRN 6105 - Therapeutic Modalities (3)

ATRN 6106 - Therapeutic Exercise Techniques (3)

ATRN 6107 - Foundations of Modern Healthcare (3)

ATRN 6109 - Clinical Evaluation and Diagnosis of the Upper Extremity (3)

ATRN 6110 - Clinical Evaluation and Diagnosis of the Head and Spine (3)

ATRN 6111 - Therapeutic Interventions (3)

ATRN 6113 - Patient-Centered Healthcare (3)

ATRN 6114 - General Medicine and Pharmacology I (3)

ATRN 6118 - Administration for Healthcare Professionals (3)

ATRN 6119 - General Medicine and Diagnostic Procedures (3)

ATRN 6121 - Behavioral Health in Sports Medicine (3)

ATRN 6401 - Clinical Rotation I (1)

ATRN 6402 - Clinical Rotation II (1)

ATRN 6403 - Clinical Rotation III (1)

ATRN 6405 - Clinical Rotation IV (3)

ATRN 6406 - Clinical Rotation V (6)

Degree Total = 58 Credit Hours

Advising

Each student in the MSAT program must have a major advisor, the Graduate Program Director for the MSAT program.

Assistantships

Due to clinical hour requirements, there are no assistantships available to students in the MSAT program.

Master of Science in Kinesiology

The Master of Science in Kinesiology program prepares graduate students to advance the fields of Kinesiology through evidenced-based patient care and translational research. The program emphasizes basic and clinical interdisciplinary education and research in areas of kinesiology.

The M.S. in Kinesiology offers concentrations in Clinical Exercise Physiology, Strength and Conditioning, and Applied Physiology and Neuromechanics (research thesis required).

Admission Requirements

In addition to fulfilling the University's general requirements for graduate admission at the Master's level, applicants seeking admission in to the M.S. in Kinesiology program must also:

- 1) Possess an overall cumulative GPA of 3.0 or above in all college coursework and possess an overall GPA of

3.25 on all upper division coursework (courses completed in the Junior and Senior year of the undergraduate program)

- 2) Present satisfactory grades (C or above) on specific prerequisite courses
 - a) The Applied Physiology concentration requires a minimum of 4 credit hours of Anatomy and Physiology, 3 credit hours of Exercise Physiology, and 3 credit hours of Statistics.
 - b) The Clinical Exercise Physiology concentration requires a minimum of 4 credit hours of Anatomy and Physiology, 3 credit hours of Exercise Physiology, 3 credit hours of Exercise Testing, and 3 credit hours of Statistics.
 - c) The Strength and Conditioning concentration requires a minimum of 4 credit hours of Anatomy and Physiology and 3 credit hours of Exercise Physiology.
- 3) Present satisfactory scores on the Test of English as a Foreign Language (TOEFL), if the applicant is from a non-English speaking country.
- 4) Demonstrate evidence of sufficient interest, ability, and preparation in Kinesiology to adequately profit from graduate study, as determined by the Kinesiology Graduate faculty. This information should be included in the statement of purpose and specifically speak to the following: a) strengths, b) concentration of interest, c) career aspirations, and d) research interests (if pursuing the Applied Physiology concentration).

Note: Standardized test scores (e.g., GRE, MAT) are not required.

The deadline to change concentrations is April 1 of the first year within the program.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

Select one of the concentrations. Each concentration requires 36 credit hours approved by the Department of Applied Physiology, Health, and Clinical Sciences. A minimum of 15 credit hours presented for the degree must be courses numbered 6000 and above. The concentrations require the same 12 credit hours of core courses, but differ in their specific courses and the number of elective hours. Courses for which undergraduate credit has been awarded may not be repeated for graduate

credit. At the time of admission, up to 6 credit hours of graduate transfer credit may be accepted if approved by the Department of Applied Physiology, Health, and Clinical Sciences and the Graduate School.

Applied Physiology Concentration (Thesis required)

The Applied Physiology (AP) concentration is excellent preparation for those planning to continue their education through the Ph.D. level, either in Kinesiology or a related field (Biology, Rehabilitation Sciences, Physiology, etc.). Students selecting this concentration are also well qualified for employment in aspects of the health industry or in research labs.

Core Courses (12 credit hours)

KNES 5115 - Research Methods in Kinesiology (3)
 KNES 5232 - Physiology of Human Aging (3)
 KNES 6280 - Advanced Exercise Physiology (3)
 KNES 6285 - Advanced Cardiopulmonary Physiology (3)

Required Concentration Courses (15 credit hours)

KNES 6171 - Advanced Biomechanics (3)
 KNES 6800 - Directed Independent Study (3)
 KNES 6900 - Research and Thesis in Kinesiology (6)
 RSCH 6110 - Descriptive and Inferential Statistics (3)
 or STAT 6127 - Introduction to Biostatistics (3)

Elective Concentration Courses (9 credit hours)

Acceptable elective courses include any course at or above the 5000 level.

Clinical Exercise Physiology Concentration (Thesis optional)

The Clinical Exercise Physiology (CEP) concentration is a CAAHEP-accredited program that is designed to prepare students to become Registered Clinical Exercise Physiologists. Clinical Exercise Physiologists are employed in inpatient and outpatient clinical/rehabilitation settings (e.g., Cardiopulmonary Rehab programs), general wellness/fitness commercial and corporate settings, and industrial settings that provide health care services for both diseased and healthy populations. Through a blend of classroom instruction and clinical experience, the degree program teaches a wide variety of specific healthcare skills, knowledge, and behaviors within the cardiovascular, pulmonary, metabolic, neoplastic, musculoskeletal, neuromuscular, and immunologic practice areas.

Core Courses (12 credit hours)

KNES 5115 - Research Methods in Kinesiology (3)
 KNES 5232 - Physiology of Human Aging (3)
 KNES 6280 - Advanced Exercise Physiology (3)
 KNES 6285 - Advanced Cardiopulmonary Physiology (3)

Required Concentration Courses (21 credit hours)

KNES 6120 - Advances in Clinical Exercise Physiology (3)
 KNES 6121 - Clinical Practice in Exercise Physiology (3)
 KNES 6134 - Exercise Prescription for Cardiopulmonary and Metabolic Disorders (3)
 KNES 6151 - Exercise Testing Methods (3)
 KNES 6292 - Exercise Prescription for Musculoskeletal Disorders (3)
 KNES 6370 - EKG Interpretation (2)
 KNES 6380 - Clinical Exercise Physiology Prep (1)
 KNES 6490 - Advanced Practicum in Clinical Exercise Physiology (1) (*taken 3 times*)

Note: Each Practicum credit is equivalent to 200 clinical hours. Clinical practicum usually begins in the third semester of the student's program and are arranged through the Practicum Coordinator within the Department of Applied Physiology, Health, and Clinical Sciences.

Elective Concentration Course (3 credit hours)

Acceptable elective courses include any course at or above the 5000 level.

Strength and Conditioning (S&C) Concentration

The modern Strength and Conditioning profession relies heavily on evidence-based research in implementing strength and conditioning programs. The curriculum for the active and available sports performance concentration consists of high quality instruction on cutting edge theoretical concepts related to strength and conditioning. The instructors are researchers trained and certified in strength and conditioning from professional organizations, including the National Strength and Conditioning Association (NSCA). In addition, students have practical requirements with exposure to innovative programming with Charlotte 49ers Athletics and successful community facilities. Since the majority of strength and conditioning positions require a master's degree with certifications from reputable organizations including NSCA, the Strength and Condition concentration produces highly qualified and marketable practitioners in career fields related to athletic performance.

Core Courses (6 credit hours)

KNES 5115 - Research Methods in Kinesiology (3)
 KNES 6280 - Advanced Exercise Physiology (3)

Required Concentration Courses (27 credit hours)

KNES 5100 - Organization and Administration of Strength and Conditioning (3)
 KNES 6151 - Exercise Testing Methods (3)
 KNES 6171 - Advanced Biomechanics (3)
 KNES 6262 - Nutrition for Sports Performance (3)
 KNES 6282 - Skeletal Muscle for Health and Disease (3)
 KNES 6320 - Advanced Principles of Strength and Conditioning (3)
 KNES 6340 - Periodization of Resistance Training (3)

KNES 6291 - Coaching Pedagogy for Strength and Conditioning Practitioners (3)
 KNES 6491 - Strength and Conditioning Field Experience (1)* (*Take 3 times*)

Elective Concentration Course (3 credit hours)

Select one KNES course at the 6000 level or above.

Comprehensive Examination

All candidates for the degree must pass a comprehensive examination.

Applied Physiology Concentration

Students selecting the Applied Physiology concentration must present credit for at least 6 credit hours of KNES 6900 and pass a thesis defense. Students who fail to maintain a thesis progression schedule as agreed with their thesis advisor may be released by their thesis advisor. If a student is released by their thesis advisor, they will have 1 academic month or until the end of the current term to find a new advisor. If a new advisor cannot be found, the student is removed from the program at the end of the current term.

Clinical Exercise Physiology Concentration

Students selecting the Clinical Exercise Physiology concentration have two attempts to pass the comprehensive examination. Students' first attempt is to pass the Clinical Exercise Physiologist examination (CEP), administered by the American College of Sports Medicine. The opportunity to take that exam will be scheduled. If students do not pass the CEP, their second attempt is the scheduled faculty-driven comprehensive examination. This examination is offered one time during the Fall and Spring semester, and is not offered during the Summer. If CEP concentration students are also doing work for a thesis, then they may present credit for at least 3 credit hours of KNES 6900 and pass a thesis defense. Failing the comprehensive competency exam, students are dismissed from the M.S. in Kinesiology program.

Strength and Conditioning Concentration

Students selecting the Strength and Conditioning concentration have two attempts to pass the comprehensive examination. Students' first attempt is to pass the Certified Strength and Conditioning Specialist (CSCS) exam offered by The National Strength & Conditioning Association (NSCA). The opportunity to take that exam will be scheduled. If students do not pass the CSCS exam, their second attempt is the scheduled faculty-driven comprehensive examination. This examination is offered one time during the Fall and Spring semester, and is not offered during the Summer. Students who enter the program with the CSCS credential will receive two attempts at the faculty-driven comprehensive exam. If S&C concentration students are also doing work for a thesis, then they may present credit for at least 3 credit

hours of KNES 6900 and pass a thesis defense. Failing the comprehensive competency exam, students are dismissed from the M.S. in Kinesiology program.

Degree Total = 36 Credit Hours

Academic Standing

The M.S. in Kinesiology program follows all academic standing, suspension, and appeal policies set forth by UNC Charlotte with one exception. The Department of Applied Physiology, Health, and Clinical Sciences requires that no course listed on a master's student's candidacy form be older than six years at the time of graduation. Courses that exceed this time limit must be retaken.

Advising

Each student in the M.S. in Kinesiology program must have a major advisor. Upon acceptance into the program, each student is assigned an advisor. For students in the AP concentration, the Graduate Program Director is the academic co-advisor along with the thesis advisor. Students in the AP concentration work with their major advisor to develop an advisory committee. The advisory committee must have at least 3 members (including the major advisor) and the majority of which must be from the Department of Applied Physiology, Health, and Clinical Sciences. For students in the CEP and S&C concentrations, the Graduate Program Director is listed as the primary advisor. Any course substitutions must be approved by the academic advisor.

Assistantships

Positions as a graduate assistant or teaching assistant may be available. Grant funded assistantships may be available as well. Students seeking assistantships should contact the Graduate Program Director of the Kinesiology program. In general, applications for graduate assistantship awards for the academic year are made by the preceding February 1.

Continuous Registration

Students in graduate degree programs are required to maintain continuous registration (Fall and Spring semesters) for thesis, dissertation, project, or directed study until work is completed.

Financial Aid/Financial Assistance

A wide range of opportunities for financial aid/assistance is available to qualifying students, which may be accessed through the Office of Student Financial Aid. See the Financial Information section of this *Catalog* for more information on the opportunities that are available, and how to contact the Office of Student Financial Aid.

Grade Requirements

The M.S. in Kinesiology program follows all grading

policies set forth by UNC Charlotte. A minimum grade point average of 3.0 is required on all coursework attempted for the degree. Students who receive two grades of C will be removed from the program and will need to successfully complete the appeal procedure. Please reference the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for specific information related to any grading policy questions. The grade of I is assigned at the discretion of the instructor when a student who is otherwise passing has not, due to circumstances beyond their control, completed all the work in the course. The missing work must be completed within 12 months (exact date determined by instructor) or the I will be changed to a U.

Program Certifications

Completion of the Clinical Exercise Physiology concentration qualifies the graduate to take the Clinical Exercise Physiology Examination (CEP) administered by the American College of Sports Medicine. Completion of the Strength and Conditioning concentration qualifies the graduate to take the Certified Strength and Conditioning Specialist certification administered by the National Strength and Conditioning Association.

Research Opportunities/Experiences

A range of research opportunities exist in the Department of Applied Physiology, Health, and Clinical Sciences for qualified students. Students are encouraged to become engaged in the research focus of the department.

Tuition Waivers

Tuition waivers may be available through a variety of sources. Students interested in pursuing tuition waivers should contact the Graduate Program Director in the semester prior to enrolling for courses.

Master of Science in Respiratory Care

The UNC Charlotte Master of Science in Respiratory Care (MSRC) program is a fully online program designed for respiratory care professionals. The program prepares respiratory therapists to advance the respiratory care profession through leadership and evidence-based practice. Students have the opportunity to pursue relevant topics that can be applied to current practice. The program provides graduates with additional knowledge, skills, and competencies that support advancement opportunities in clinical and educational leadership, scholarship and research, and disease management.

Admission Requirements

In addition to Graduate School admission requirements, admission requirements for acceptance into the program

include:

- Bachelor's degree in Respiratory Therapy, related science, or social science from a college or university accredited by an accepted accrediting body
- Minimum GPA of 3.0 (on a 4.0 scale). If an applicant has earned or attempted a post-baccalaureate degree (i.e., a master's, doctoral, or other), grades in that program will also be taken into consideration.
- Registered Respiratory Therapist (achieving and maintaining the RRT Credential offered by the National Board of Respiratory Care (NBRC))
- Current state license to practice Respiratory Therapy
- Professional experience consisting of at least 2 years of clinical Respiratory Therapy practice
- Written statement of the applicant's educational goals and expectations of the program
- Evidence of knowledge in the field from academic or professional colleagues or supervisors in the form of 2 reference letters

Documents that applicants must provide for application review include:

- Associate and Bachelor's degree transcripts
- Registered Respiratory Therapist (RRT Credential)
- Copy of current state license
- Statement of Purpose: 500 to 1000 words describing the applicant's educational goals and expectations of the program
- Two letters of recommendation from individuals with academic or professional knowledge of the applicant's capabilities

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The program requires the completion of 30 credit hours in approved courses.

RESP 5101 - Health Outcomes and Quality Assessment (3)
 RESP 6101 - Respiratory Care Leadership (3)
 RESP 6104 - Health Policy, Law, and Ethics in the Health Professions (3)
 RESP 6105 - Pulmonary Function Testing and Cardiopulmonary Rehabilitation (3)
 RESP 6106 - Ventilation Application and Monitoring (3)
 RESP 6110 - Cardiopulmonary Disease Management (3)

RESP 6115 - Research Methods for Respiratory Care (3)
 RESP 6601 - Emerging Issues in Respiratory Care Seminar (3)
 or NURS 6282 - Interprofessional Collaboration in Healthcare (3)
 RESP 6111 - Patient-Centered Care in Cardiopulmonary Disease (3)
 RESP 6804 - Respiratory Care Capstone II (3)

Degree Total = 30 Credit Hours

Student Learning Outcomes

Students are required to successfully complete all direct effectiveness measures for the four Student Learning Outcomes to complete the program:

- 1) **Leadership:** Students apply leadership theories and evidence-based practice concepts to plan and make collaborative and effective decisions relevant to respiratory care services or education.
- 2) **Evidence-Based Practice:** Students conduct scholarly activities using evidence-based practice concepts, research methodology, and statistical procedures relevant to study of or application to respiratory care.
- 3) **Professional Communication:** Students develop culturally competent and effective oral and written communication for professional interactions.
- 4) **Cardiopulmonary Disease Management:** Students develop evidence-based care plans in the prevention, diagnosis, treatment, and management of patients with cardiopulmonary diseases.

Advanced Respiratory Care Practice Concentration

The UNC Charlotte Master of Science in Respiratory Care - Advanced Respiratory Care Practice (MSRC-ARCP) concentration is designed for registered respiratory therapists who desire to seek clinical leadership opportunities as an advanced practice provider. The concentration prepares registered respiratory therapists to provide evidence-based, diagnostic and therapeutic clinical practice and disease management under the supervision of licensed physician.

Admission Requirements

- Graduate of a CoARC accredited respiratory therapy education program
- Bachelor's degree in Respiratory Therapy, related science, or social science from an accepted accredited college or university.
- Accepted accrediting bodies: Accrediting Commission for Community and Junior Colleges (ACCJC) Western Association of Schools and Colleges, Higher Learning Commission (HLC),

Middle States Commission on Higher Education (MSCHE), New England Commission of Higher Education (NECHE), Northwest Commission on Colleges and Universities (NWCCU), Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), and WASC Senior College and University Commission (WSCUC)

- GPA 3.0 (on a 4.0 scale). If an applicant has earned or attempted a post-baccalaureate degree (i.e. a master's, doctoral or other), grades in that program will also be taken into consideration.
- Registered Respiratory Therapist (achieving and maintaining the RRT Credential offered by the National Board of Respiratory Care).
- Current state license to practice Respiratory Therapy.
- Minimum of one year experience as a Registered Respiratory Therapist
- Completion of NURN 3108 Health Assessment for Nurses or its equivalent with a grade of C or above
- Current Resume
- Written statement of purpose (500 -1000 words) describing the applicant's educational goals and expectations of the program.
- Two professional letters of recommendation from colleagues or supervisors are required.
- Complete and submit an application via the Graduate School's admission system.

Degree Requirements

Required Core Courses (15 credit hours)

RESP 6104 - Health Policy, Law, and Ethics in the Health Professions (3)

RESP 6105 - Pulmonary Function Testing and Cardiopulmonary Rehabilitation (3)

RESP 6110 - Cardiopulmonary Disease Management (3)

RESP 6111 - Patient-Centered Care in Cardiopulmonary Disease (3)

RESP 6115 - Research Methods for Respiratory Care (3)

Required Concentration Courses (34 credit hours)

KNES 6285 - Advanced Cardiopulmonary Physiology (3)

NURS 6220 - Pharmacotherapeutics in Advanced Nursing Practice (3)

NURS 6230 - Advanced Health Assessment and Diagnostic Reasoning for Advanced Practice (3)

NURS 6274 - Advanced Human Pathophysiology (3)

NURS 6430 - Advanced Health Assessment and Diagnostic Reasoning Practicum (1)

RESP 6116 - Inquiry and Application of Evidence-Based Practice (3)

RESP 6120 - Advanced Cardiopulmonary Diagnostics and Therapeutics (3)

RESP 6202 - Respiratory Care Advanced Practice (3)

RESP 6404 - Clinical Practice in Advanced Respiratory Care I (3)

RESP 6405 - Critical Practice in Advanced Respiratory Care II (2)

RESP 6406 - Clinical Practice in Advanced Respiratory Care III (3)

RESP 6407 - Clinical Practice in Advanced Respiratory Care IV (2)

RESP 6605 - Project Development I (1)

RESP 6606 - Project Development II (1)

RESP 6607 - Project Development III (1)

Degree Total = 49 Credit Hours

Graduate Certificate in Respiratory Care Clinical Concepts

*****This is a Distance Education program.*****

The Graduate Certificate in Respiratory Care Clinical Concepts is designed to provide additional knowledge and skills on advanced diagnostic and therapeutic clinical concepts in the care of patients with cardiopulmonary disorders. The Graduate Certificate is 100% online and requires the completion of 12 credit hours of courses.

Admission Requirements

- Bachelor's degree in respiratory therapy, related health science, or social science from a college or university accredited by an accepted accredited body
- Registered Respiratory Therapy (RRT) Credential in good standing
- Respiratory Care Practitioner State License in good standing
- Minimum GPA of 2.75 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school)
- Online application through the Graduate School's application system
- Statement of purpose
- Unofficial transcripts of all college coursework attempted

Certificate Requirements

Required Courses (12 credit hours)

RESP 6105 - Pulmonary Function Testing and Cardiopulmonary Rehabilitation (3)

RESP 6106 - Ventilation Application and Monitoring (3)

RESP 6110 - Cardiopulmonary Disease Management (3)

RESP 6115 - Research Methods for Respiratory Care (3)

Certificate Total = 12 Credit Hours

Grade Requirements

- A minimum 3.0 GPA is required to graduate with the certificate
- No more than one course with a grade of C; courses graded as C on the certificate plan of study must be offset by an equal number of graduate-level credits graded as A
- Courses with a grade of C cannot be transferred to the M.S. in Respiratory Care program; the course will need to be repeated if enrolled in the MSRC program

Graduate Certificate in Respiratory Care Leadership

*****This is a Distance Education program.*****

The Graduate Certificate in Respiratory Care Leadership is designed to provide additional knowledge and skills in the application of leadership, quality assessment, and health policy concepts in the healthcare environment. The Graduate Certificate is 100% online and requires the completion of 12 credit hours of courses.

Admission Requirements

- Bachelor's degree in respiratory therapy, related health science, or social science from a college or university accredited by an accepted accredited body
- Registered Respiratory Therapy (RRT) Credential in good standing
- Respiratory Care Practitioner State License in good standing
- Minimum GPA of 2.75 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school)
- Online application through the Graduate School's application system
- Statement of purpose
- Unofficial transcripts of all college coursework attempted

Certificate Requirements**Required Courses (9 credit hours)**

RESP 5101 - Health Outcomes and Quality Assessment (3)

RESP 6101 - Respiratory Care Leadership (3)

RESP 6104 - Health Policy, Law, and Ethics in the Health Professions (3)

Elective Course (3 credit hours)

Select one of the following:

NURS 6282 - Interprofessional Collaboration in Healthcare (3)

RESP 6601 - Emerging Issues in Respiratory Care Seminar (3)

Certificate Total = 12 Credit Hours**Grade Requirements**

- A minimum 3.0 GPA is required to graduate with the certificate
- No more than one course with a grade of C; courses graded as C on the certificate plan of study must be offset by an equal number of graduate-level credits graded as A
- Courses with a grade of C cannot be transferred to the M.S. in Respiratory Care program; the course will need to be repeated if enrolled in the MSRC program

Epidemiology and Community Health

- **Ph.D. in Public Health Sciences**
 - Behavioral Sciences
- **Ph.D. in Epidemiology**
- **Master of Public Health (MPH)**
 - Community Health Practice
 - Epidemiology
 - Health Policy
 - Physical Activity and Nutrition
- **MPH/M.A. in Anthropology Dual Degree**
- **MPH/M.S. in Health Informatics and Analytics Dual Degree**

Department of Epidemiology and Community Health

ech.charlotte.edu

Ph.D. in Public Health Sciences

The focus of the Ph.D. in Public Health Sciences is to train researchers and professionals with skills essential to address contemporary public health problems at the individual, community, and population levels.

Students train to be well-rounded public health professionals: learning how to disseminate research to diverse audiences, publishing in peer-reviewed formats, teaching in an academic environment, and conducting themselves with high ethical standards in all venues. Full-time students can complete the degree requirements within 4 years; however, most full-time students complete the program within 5 years depending upon the design of their dissertation research. Graduates are prepared to work in academia, conduct large-scale public health research projects, or work in government or health-related venues.

Concentration in Behavioral Sciences

The Concentration in Behavioral Sciences emphasizes investigation of health determinants related to the prevention and management of disease and disability among diverse and vulnerable populations in the United States. Working with the community in multidisciplinary teams to understand and develop programs that address the broad social-ecological factors that influence health behavior and thus health outcomes is the primary emphasis of this concentration.

Coursework for the Ph.D. in Public Health Sciences with a Concentration in Behavioral Sciences has a dual emphasis on qualitative and quantitative methods, and the development, application, and measurement of theory to understand the social and cultural factors that influence health behavior. Graduates are prepared to work in academia, conduct large-scale behavioral research projects, or work in government or health-related venues.

Admission Requirements

All applicants must complete an online application to the Graduate School. The minimum admission requirements for the program are as follows:

1. A Master's degree in Public Health or a related field with a minimum GPA of 3.5 (on a 4.0 scale) in all graduate work. Students who have not completed a Master's degree in Public Health may be required to take additional courses as determined by the Ph.D. Review Committee upon review of current CEPH requirements. Such courses will be specified at the time of admission into the program.
2. GRE scores are optional. GRE scores, if submitted, are one of many factors considered when evaluating applications. GRE scores are highly recommended for applicants who do not have a strong record of relevant quantitative coursework.
3. Non-native speakers of English that do not hold a degree from a US university must demonstrate English language proficiency. Please visit the Graduate School website for accepted standardized tests and minimum scores.
4. All applicants are required to submit a personal statement explaining why they want to pursue the Ph.D. in their specific area of research at UNC Charlotte. Please visit the Ph.D. program's website or contact the Program Director for further information on what to include in the personal statement.
5. In addition to the personal statement, a writing sample is required for all applications to the Ph.D. program. The writing sample should demonstrate aptitude for scholarly writing (e.g., a literature review, a report of a needs assessment or evaluation project, a master's thesis, or a published original research article on a public health topic). Detailed information is provided on the Ph.D. program's website.
6. Three letters of recommendation, including at least two letters from former professors familiar with the applicant's graduate work. Exceptions should be discussed with the Program Director.
7. A copy of transcripts from all prior universities or colleges. (note: official transcripts will be needed at the time of matriculation).
8. Resume/CV

We look at an application in its entirety to determine a person's strengths and relative fit to our program; availability of advisors, areas of research interest, and academic history are important considerations, as is research and public health practice work experience.

Admission Assessment

For fullest consideration of admission and financial awards, applications need to be completed by January 10. This deadline is especially important for applicants who want to be considered for assistantships or for fellowship opportunities. Applications completed after January 10 but by March 15 will be reviewed, and decisions regarding admission made on a space-available basis.

Prerequisite Coursework

Students who graduated with an MPH or MSPH degree from a CEPH accredited program or school are assumed to have met the required prerequisite foundation courses. Students entering with a master's degree in a field other than public health must complete the Required Prerequisite Foundation courses in Public Health in the first year of starting the program in consultation with the Ph.D. Director and/or Advisor. These prerequisite foundation course credits do not count toward the 63 credit hours required for the Ph.D.

Required Prerequisite Foundation Courses in Public Health (9 credit hours)

HLTH 6200 - Case Studies in Public Health (3)
HLTH 6211 - Evidence-Based Methods in Public Health (3)
HLTH 6271 - Public Health Data Analysis (3)

Degree Requirements

This degree program requires 63 post-master's credit hours. All coursework must be taken at the 6000-level or above. The majority of the courses are at the 8000-level.

Core Methods Courses (15 credit hours)

HLTH 8201 - Introduction to Quantitative Research Design (3)
HLTH 8270 - Applied Biostatistics: - Regression (3)
HLTH 8271 - Applied Biostatistics: - Multivariate Methods (3)
HLTH 8281 - Measurement and Scale Development (3)
HLTH 8282 - Health Survey Design and Research (3)

Professional Seminar Courses (9 credit hours)

HLTH 8601 - Ethics and Integrity in Health Research and Practice (3)
HLTH 8602 - Communicating and Disseminating Research (1)
HLTH 8603 - Teaching Portfolio (3)
HSRD 8604 - Seminar in Health Outcomes (1)
HSRD 8605 - Seminar in Grant Proposal Writing (1)

Concentration in Behavioral Sciences Courses (12 credit hours)

HLTH 8220 - Theories and Interventions in Behavioral Science (3)
HLTH 8221 - Qualitative Research in Behavioral Sciences (3)
HLTH 8223 - Social Determinants of Health (3)
HSRD 8261 - Healthcare Program Evaluation, Outcomes, and Quality (3)

Specialty Content Courses (9 credit hours)

Specialty content areas are developed in consultation with the doctoral student's advisor and make use of expertise and course offerings on the UNC Charlotte campus. Specialty content areas can focus on a specific population (e.g., older adults/gerontology or maternal and child health (MCH)), a health issue (e.g., AIDS), or approach (e.g., psychology). A specialty content area should cover literature related to: health and social policy issues, epidemiology of a health condition/population, relevant theories or approaches related to the condition/population, and/or current topics in the area. Coursework must be at the 6000-8000 level.

Dissertation Courses (18 credit hours)

HLTH 8901 - Dissertation Research (3, 6, or 9)

Degree Total = 63 Credit Hours

Grade Requirements

Students must maintain a minimum cumulative 3.0 GPA (on a 4.0 scale) in all coursework taken in the program. An accumulation of 2 C grades will result in suspension of enrollment in the doctoral program.

A grade of U or N constitutes an automatic termination of enrollment. Furthermore, a second failure of the comprehensive exam, the dissertation proposal defense, or the final dissertation defense also results in dismissal from the program.

Transfer Credit

The UNC Charlotte Graduate School stipulates that students may transfer up to 30 graduate level credit hours from a college or university accredited by an accepted accrediting body toward a doctoral degree. This Ph.D. program limits master's level transfer credits to at most 6 credit hours. Master's level transfer credits will be considered only toward Specialty Content courses, the Ethics Seminar (HLTH 8601), and the Measurement course (HLTH 8281). The Ph.D. Program Director, in conjunction with Program Faculty, approves graduate level transfer credits. Students must apply for transfer of graduate levels courses within the first year of enrollment, or within one semester following completion of the course if taken during the Ph.D. program. Only courses in which the

student earned a grade of B or above (or its equivalent) may be transferred.

Students transferring from another doctoral program can transfer up to 30 credit hours (with not more than 6 at the master's level) upon approval of the Ph.D. Program Director. Credit for dissertation research cannot be transferred.

Courses taken to fulfill the master's level prerequisite public health courses do not count toward the 63 credit hour total.

Assistantships

Exceptionally qualified full-time students may be offered graduate assistantships. Award of the assistantship follows the guidelines of the Graduate School and is dependent on availability of funds.

Comprehensive Exam and Advancing to Candidacy

The comprehensive examination takes place at least once per year. The comprehensive examination consists of three sections: 1) Methods section, 2) Social-behavioral section, and 3) Integrative section. The examination must be taken and passed prior to enrollment in dissertation research credit hours (HLTH 8901). Specific procedures regarding the grading of the comprehensive examination are detailed in the *Public Health Sciences Ph.D. Student Handbook*.

A doctoral student advances to candidacy after the dissertation proposal has been approved by the student's Dissertation Committee and the Graduate School. Candidacy must be achieved at least one term prior to the term of graduation.

Dissertation

The dissertation is an original research project conceived, conducted, analyzed, and interpreted by the student to demonstrate expertise in her/his concentration and chosen specialty area as it relates to public health. The research must make a distinct, original contribution to the field of public health research. Students cannot register for dissertation credits until they have passed their comprehensive examination. Students must complete a minimum of 18 credit hours of dissertation research activity. Per University policy, students must be continuously enrolled in dissertation credit hours beginning with the semester after the dissertation topic proposal is approved, through and including the semester of graduation. Guidelines for selecting a Dissertation Chair and Committee Members are provided in detail in the *Public Health Sciences Ph.D. Student Handbook*. The dissertation consists of three phases: the proposal defense, research, and the final dissertation defense.

In conjunction with the Dissertation Committee, students agree on the dissertation topic and indicate their preferred dissertation format – either the “traditional” 5-chapter model or the 3-manuscript model. The dissertation proposal consists of three chapters: 1) introduction to the problem including the importance of the problem, significance of the proposed research, the research question and hypotheses; 2) conceptual model and literature review; and 3) a detailed methods section including sampling, recruitment, measures, data analysis, and limitations. With the guidance of the Dissertation Chair, students work with each committee member individually to develop the scope and direction of the dissertation. Students provide the overall idea for the dissertation including major concepts to be investigated, measures to be used, and strategy for primary or secondary data analysis. The dissertation topic proposal must be defended at a meeting of the student's advisory/dissertation committee.

The dissertation defense is scheduled when the Dissertation Chair and the student concur that the student has a final product that meets with initial committee member approval. The outcome of the exam is pass or fail. Details regarding development of the dissertation proposal, proposal defense, conducting the dissertation research, and dissertation defense are available in the *Public Health Sciences Ph.D. Student Handbook*.

Program Progress

Doctoral students and candidates are evaluated annually to ensure that they are making sufficient progress to complete the degree in a timely manner. This evaluation is especially important during the dissertation process when students have less programmatic interaction and structure as they work more independently conducting their dissertation research. Please consult the *Public Health Sciences Ph.D. Student Handbook* for further details.

Time Limits for Completion

Students must pass all sections of the comprehensive exam within one year of finishing their required coursework. Students may not defend their dissertation proposal before passing all components of the comprehensive exam. Students must pass their dissertation proposal defense within 6 months of passing the comprehensive exam. Students must pass their dissertation defense within five years of the proposal defense, but not later than the end of their eighth year following matriculation as a doctoral student. Students must complete their degree, including the dissertation, within nine years of first registering as a doctoral student.

Residency Requirement

Residency requirements for the program include completing 21 hours of continuous enrollment, either as

coursework or dissertation credits. Residence is considered to be continuous if the student is enrolled in one or more courses in successive semesters until 21 hours are earned.

Ph.D. in Epidemiology

Epidemiology, a core discipline of public health, is the study of the distribution and risk factors of diseases and health conditions in populations. Our post-master's Ph.D. program in Epidemiology prepares future researchers and public health practitioners to develop and conduct studies and apply quantitative methods to understand and solve complex public health problems. The program, through its rigorous coursework in epidemiologic and public health methods, electives, and teaching experience, prepares graduates for a career in academia, government, or industry. The cornerstone of the program is the student's dissertation, which is expected to be a significant contribution based on original and independent research leading to publications in peer-reviewed, indexed journals. Full-time students can complete the degree requirements within 4 years; however, most full-time students complete the program within 5 years, depending upon the design of their dissertation research.

See the [Epidemiology department website](#) for more information.

Admission Requirements

All applicants must complete an online application to the Graduate School. The minimum admission requirements for the program are as follows:

- A master's degree in public health or a related field with a minimum GPA of 3.5 (on a 4.0 scale) in all graduate work. Students who have not completed a master's degree in public health may be required to take additional courses as determined by the Ph.D. Review Committee upon review of current CEPH requirements. Such courses will be specified at the time of admission into the program.
- GRE scores are optional. GRE scores, if submitted, are one of many factors considered when evaluating applications. GRE scores are highly recommended for applicants who do not have a strong record of relevant quantitative coursework.
- Non-native speakers of English that do not hold a degree from a US university must demonstrate English language proficiency. Please visit the Graduate School website for accepted standardized tests and minimum scores.
- All applicants are required to submit a personal statement explaining why they want to pursue a Ph.D. in their specific area of research at UNC Charlotte. Please visit the Ph.D. program's website or contact the

Program Director for further information on what to include in the personal statement.

- In addition to the personal statement, a writing sample is required for all applications to the Ph.D. program. The writing sample should demonstrate aptitude for scholarly writing, e.g., a literature review, a report of a needs assessment or evaluation project, a master's thesis, or a published original research article on a public health topic. Detailed information is provided on the program's website.
- Three letters of recommendation, including at least two letters from former professors familiar with the applicant's graduate work. Exceptions should be discussed with the program director.
- A copy of transcripts from all prior universities or colleges. Note: Official transcripts will be needed at the time of matriculation.
- Resume/CV

We look at an application in its entirety to determine a person's strengths and ability to succeed in our program; availability of advisors, areas of research interest, and academic history are important considerations, as is research and public health practice work experience.

Admission Assessment

For the fullest consideration of admission and financial awards, applications need to be completed by January 10. This deadline is especially important for applicants who want to be considered for assistantships or fellowship opportunities. Applications completed after January 10 but by March 15 will be reviewed, and decisions regarding admission will be made on a space-available basis.

Prerequisite Coursework

Students who graduated with an MPH from a CEPH accredited program or school are assumed to have met the required prerequisite foundation courses. Students lacking coursework in foundational public health knowledge and graduate level epidemiology may have to complete the required prerequisite foundation courses in Public Health in the first year of starting the program in consultation with the Ph.D. Program Director. Accepted applicants should discuss their prior training with the Ph.D. Program Director to ensure that prerequisites will be met in the first semester. These prerequisite foundation course credits do not count toward the 69 credit hours required for the Ph.D.

Required Prerequisite Foundation Courses in Public Health (9 credit hours)

HLTH 6200 - Case Studies in Public Health (3)

HLTH 6211 - Evidence-Based Methods in Public Health (3)

HLTH 6271 - Public Health Data Analysis (3)

Degree Requirements

The Ph.D. in Epidemiology program requires 69 post-master's credit hours. This program emphasizes courses in research methods and analysis, as well as experiences working with faculty on research to support the development of research skills to carry out the dissertation on a significant research problem in the area of epidemiology.

Public Health Methods (15 credit hours)

EPID 8202 - Introduction to Data Management (3)
 HSRD 8260 - Design of Health Services Research (3)
 HLTH 8270 - Applied Biostatistics: Regression (3)
 HLTH 8271 - Applied Biostatistics: Multivariate Methods (3)
 HLTH 8282 - Health Survey Design and Research (3)

Professional Seminars (9 credit hours)

HSRD 8600 - Seminar in Health Services Research (1)*
 * (Three one-credit hour seminars)
 HLTH 8601 - Ethics and Integrity in Health Research and Practice (3)
 HLTH 8603 - Teaching Portfolio (3)

Epidemiology Methods (18 credit hours)

EPID 8272 - Survival Analysis (3)
 EPID 8273 - Multilevel and Longitudinal Data Analysis (3)
 EPID 8274 - Advanced Methods in Epidemiology (3)
 EPID 8275 - Spatial Epidemiology (3)
 EPID 8276 - Systematic Reviews and Meta-analysis (3)
 HLTH 6260 - Analytic Epidemiology (3)

Electives (9 credit hours)

Choose 3 from the list below or other graduate course(s) approved by Program Director.

ECON 5141 - Economics of Health and Healthcare (3)
 HLTH 8221 - Qualitative Research in Behavioral Sciences
 HLTH 8223 - Social Determinants of Health (3)
 HSRD 8204 - Health Policy (3)
 HSRD 8261 - Healthcare Program Evaluation, Outcomes, and Quality (3)

Dissertation (18 credit hours)

HSRD 8901 - Dissertation Research (3, 6, or 9)

Degree Total = 69 Credit Hours

Grade Requirements

Students must maintain a cumulative average of 3.0 in all coursework taken in the program. The seminars are graded on a Pass/Unsatisfactory basis and, therefore, are not included in the cumulative average. An accumulation of two C grades results in termination of a student's enrollment in the doctoral program. A second failure in any of the following results in dismissal from the program: the qualifying examination; the dissertation proposal defense; or final dissertation defense. If a student receives a grade of U or NC in any course, enrollment is

terminated. A doctoral student whose enrollment has been terminated due to grades is ineligible to register in any semester or summer session.

Transfer Credit

Students can transfer a maximum of six credit hours or 2 Ph.D. level courses from a CEPH accredited program. Transfer credit must be approved by the Program Director. Only courses with grades of A or B will be accepted for transfer credit. Students transferring from another doctoral program can transfer up to 30 credit hours (with not more than 6 at the master's level) upon approval of the Program Director. Credit for dissertation research cannot be transferred. Courses taken to fulfill the master's level prerequisite public health courses do not count toward the 69 credit hour total.

Assistantships

Exceptionally qualified full-time students may be offered graduate assistantships. The award of the assistantship follows the guidelines of the Graduate School and is dependent on the availability of funds.

Qualifying Examination and Advancing to Candidacy

The qualifying examination takes place at least once per year. The examination must be taken and passed prior to enrollment in dissertation research credit hours (HSRD 8901). Specific procedures, contents, and grading of the comprehensive examination are detailed in the Epidemiology Ph.D. Student Handbook.

A doctoral student advances to candidacy after the dissertation proposal has been approved by the student's Dissertation Committee and the Graduate School. Candidacy must be achieved at least one term prior to the term of graduation.

Dissertation

The dissertation is an original research project conceived, conducted, analyzed, and interpreted by the student to demonstrate expertise in her/his topic as it relates to epidemiology. The research must make a distinct, original contribution to the field of epidemiologic research. Students cannot register for dissertation credits until they have passed their comprehensive examination. Students must complete a minimum of 18 credit hours of dissertation research activity. Per University policy, students must be continuously enrolled in dissertation credit hours beginning with the semester after the dissertation topic proposal is approved, through and including the semester of graduation.

The dissertation consists of three phases: the proposal defense, research, and the final dissertation defense. Guidelines for selecting a Dissertation Chair and

Committee Members are provided in detail in the Epidemiology Ph.D. Student Handbook. In conjunction with the Dissertation Committee, students agree on the dissertation topic and indicate their preferred dissertation format – either the “traditional” 5-chapter model or the 3-manuscript model.

The dissertation proposal consists of three chapters: 1) introduction to the problem, including the importance of the problem, significance of the proposed research, the research question, and hypotheses; 2) conceptual model and literature review; and 3) a detailed methods section including sampling, recruitment, measures, data analysis, and limitations. With the guidance of the Dissertation Chair, students work with each committee member individually to develop the scope and direction of the dissertation. Students provide the overall idea for the dissertation, including major concepts to be investigated, measures to be used, and strategy for primary or secondary data analysis. The dissertation topic proposal must be defended at a meeting of the student’s advisory/dissertation committee.

The dissertation defense is scheduled when the Dissertation Chair and the student concur that the student has a final product that meets with initial committee member approval. The outcome of the exam is pass or fail. Details regarding the development of the dissertation proposal, proposal defense, conducting the dissertation research, and dissertation defense are available in the *Epidemiology Ph.D. Student Handbook*.

Time Limits for Completion

Students must pass all sections of the comprehensive exam within one year of finishing their required coursework. Students may not defend their dissertation proposal before passing all components of the comprehensive exam. Students are expected to pass their dissertation proposal defense within one year of passing the comprehensive exam. Students must pass their dissertation defense within five years of the proposal defense but not later than the end of their eighth year following matriculation as a doctoral student. Students must complete their degree, including the dissertation, within nine years of first registering as a doctoral student.

UNC Charlotte Residency Requirement

The student must satisfy the UNC Charlotte residency requirement for the program by completing 21 credit hours of continuous enrollment. Residence is considered to be continuous if the student is enrolled in one or more courses in successive semesters until 21 hours are earned.

Master of Public Health (MPH)

The Master of Public Health (MPH) is a practice-oriented, interdisciplinary professional degree that prepares individuals to make a positive impact on the health and well-being of local and global communities.

UNC Charlotte’s accredited MPH Program is an interdepartmental program within the College of Health and Human Services (CHHS). It is administered out of the Department of Epidemiology and Community Health. The MPH’s 4 concentrations are housed in various academic homes within CHHS.

1. Community Health Practice (CHPR)
2. Epidemiology (EPID)
3. Health Policy (HPOL) *Housed in the Department of Health Management and Policy (HMP)*
4. Physical Activity and Nutrition (PANU) *Housed in the Department of Applied Physiology, Health and Clinical Sciences (APHCS)*

The program equips students to make a lasting impact in various environments, including health-related agencies and organizations, hospitals, local and state public health departments, academic research centers and institutes, corporate disease management and wellness programs, non-profit agencies, and healthcare businesses and industries.

Admission Requirements

- 1) Recommended GPA of 3.0 or higher out of 4.0
- 2) Bachelor’s degree by time of desired enrollment
- 3) Three letters of recommendation; at least two letters are preferred from academic professors who have taught the applicant in the classroom and can confirm their written and oral abilities
- 4) Personal statement describing the applicant’s interest in public health, desired concentration, and professional goals

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required. Applicants must address the quantitative, verbal, and analytic abilities within their admissions essay.

For Non-U.S. Students

- 1) If English is not the applicant’s native language and she or he has not earned a post-secondary degree from a U.S. institution, they are required to submit official scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). Either a minimum score of 557 on the paper-based TOEFL, a minimum score of 83 on the Internet-based TOEFL, or a minimum overall band score of 6.5 on the IELTS is required.

- 2) Internationally trained physicians who have passed Step 1, Step 2 CK, and Step 2 CS of the U.S. Medical Licensing Exam (USMLE) have the equivalent of a U.S. Medical Degree (MD), can request an exemption from the English language proficiency requirements.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Admission Process

The MPH Program accepts students for both Fall and Spring admission. Applications are reviewed on a rolling basis by the Admissions Committee beginning in October for admission in Fall of the coming year. Offers for assistantships and nominations for scholarships are made for admitted students in early Spring; thus, it is recommended that candidates submit applications by the preferred submission date of January 15 for Fall admission. However, applications may be submitted after the preferred date as well.

Students applying for Spring admission should be advised that because of the budgeting cycle, there are limited opportunities for funding the first semester. Depending upon the concentration chosen, students may need to attend an extra semester based on course sequencing and frequency of course offerings. The preferred application submission date for Spring is November 1.

All admission decisions are typically made within 1 month of the application being completed and submitted.

Degree Requirements

The curriculum leading to the Master of Public Health degree requires a minimum of 45 graduate credit hours. The plan of study includes 15 credit hours of core courses; an applied learning experience (internship; 3 credit hours); a concentration with its core courses (15 credit hours) and its associated integrative learning experience or ILE (3 credit hours); and elective courses (9 credit hours).

While the program can be completed within two academic years (4 semesters plus Summer), 5 semesters is the expected time to completion for full-time students. Part-time students are expected to complete the program within 5 years (10 semesters).

Core Courses (15 credit hours)

HADM 6100 - Intro to the U.S. Healthcare System (3)
HLTH 6200 - Case Studies in Public Health (3)

HLTH 6211 - Evidence-Based Methods in Public Health (3)
HLTH 6212 - Health Promotion Program Management (3)
HLTH 6213 - Policy and Leadership (3)

Applied Learning Experience (3 credit hours)

HLTH 6471 - Public Health Internship (3)

Concentration Courses (18 credit hours)

Select one of the following concentrations, which include an associated 3 credit hour capstone course. The capstone course is an integrative learning experience where students synthesize their foundational and concentration-specific knowledge and skills. Students declare a concentration at the time of application for admission to the MPH. Students desiring to change concentrations should notify their advisor by the end of their second semester. Students must meet any eligibility requirements as outlined in the concentration.

Community Health Practice (CHPR) Concentration

The MPH concentration in Community Health Practice trains students to conduct the 3 core functions of public health: assessment, policy development, and evaluation. These activities include measuring health behavior, designing appropriate public health interventions, and implementing and evaluating health promotion, risk prevention and risk reduction services. Students completing the Community Health Practice concentration are eligible to sit for and pass the Certified Health Education Specialist (CHES) exam.

Eligibility

The Community Health Practice concentration is open to all MPH students.

Required Courses

HLTH 6220 - Applied Health Behavior Change (3)
HLTH 6225 - Health Education and Health Promotion (3)
HLTH 6226 - Community Health Methods (3)
HLTH 6227 - Community Health Planning and Evaluation (3)
HLTH 6228 - Social Determinants of Health (3)
HLTH 6230 - Community Health Practice Capstone (3)

Epidemiology (EPID) Concentration

The MPH Concentration in Epidemiology provides students a broad understanding of epidemiological principles and its application to public health practice. Through coursework, integrated learning experience, and internship, students develop quantitative and methodological skills necessary to design, conduct, analyze, and disseminate epidemiological studies.

Eligibility

The Epidemiology concentration is open to all MPH

students.

It is *recommended* that students interested in this concentration complete HLTH 6211 in their first semester of matriculation with a grade of B or above and maintain an overall GPA of 3.0 at the end of the first semester.

Required Courses

HCIP 6102 - Healthcare Data Analysis (3)
 HLTH 6270 - Epidemiologic Methods (3)
 HLTH 6271 - Public Health Data Analysis (3)
 HLTH 6273 - Infectious Disease Epidemiology
 HLTH 6280 - Epidemiology Capstone Course (3)

Elective Course

Select one of the following:

HLTH 6260 - Analytic Epidemiology (3)
 HLTH 6277 - Nutritional Assessment and Epidemiology (3)

Health Policy (HPOL) Concentration

The MPH concentration in Health Policy prepares students to engage in policy and advocacy activities that advance equity, eliminate health disparities, and transform systems. Activities include conducting policy development and analysis in collaboration with invested groups (e.g., community members, policymakers, etc.), engaging in quantitative and empirical assessments of health policy, gauging equity in policy options, and strategically advocating for health and social change.

Eligibility

The Health Policy concentration is open to MPH students who begin the program in the Fall semester only.

Required Courses

HADM 6142 - Health Policy Development (3)
 HADM 6150 - Health Law and Ethics (3)
 HLTH 6228 - Social Determinants of Health (3)
 HLTH 6241 - Quantitative Analysis of Health Policy (3)
 HLTH 6243 - Fostering Health Through Policy and Action (3)
 HLTH 6250 - Health Policy Capstone (3)

Physical Activity and Nutrition (PANU) Concentration

The MPH concentration in Physical Activity and Nutrition primes students to develop, deliver, and assess population-based, health promotion interventions related to improving physical activity and nutrition. These activities include selecting appropriate behavior assessment tools, designing appropriate educational interventions, and assessing behavioral levels to determine risk.

Eligibility

The Physical Activity and Nutrition concentration is open to all MPH students.

Required Courses

HLTH 6104 - Population Perspectives on Nutrition and Physical Activity (3)
 HLTH 6220 - Applied Health Behavior Change (3)
 HLTH 6230 - Community Health Practice Capstone (3)
 HLTH 6277 - Nutritional Assessment and Epidemiology (3)
 KNES 5232 - Physiology of Human Aging (3)
 KNES 6110 - Assessment of Physical Activity Across the Lifespan (3)

Elective Courses (9 credit hours)

MPH students are required to take 2 elective courses with the HLTH prefix and 1 interprofessional elective course outside the department. MPH students enrolled in a Graduate Certificate program (e.g., Emergency Management, Gerontology, or Health Informatics and Analytics) by the end of their first year, may be eligible to substitute some of their certificate credit hours for their MPH elective credit hours. Please consult the MPH Program Director for further details.

Cross-Cutting Elective Course (3 credit hours)

Select a course from one of the MPH concentrations outside of the one in which the student is enrolled OR one of the following:

HLTH 5090 - International Comparative Health Systems (3)
 HLTH 6101 - International Health (3)
 HLTH 6103 - Maternal and Child Health Systems (3)
 HLTH 6104 - Population Perspectives on Nutrition and Physical Activity (3)

Restricted Elective Course (3 credit hours)

Select a second course from the Cross-Cutting Elective courses OR one of the following:

HCIP 6380 - Introduction to Health Informatics (3)
 HLTH 5000 - Topics in Public Health (3)
 HLTH 6000 - Special Topics in Public Health (3)
 HLTH 6225 - Health Education and Health Promotion (3)
 HLTH 6226 - Community Health Methods (3)
 HLTH 6228 - Social Determinants of Health (3)
 HLTH 6273 - Infectious Disease Epidemiology (3)

Interprofessional Elective Course (3 credit hours)

Complete one master's level course with a topic relevant to public health from any discipline outside the Department of Epidemiology and Community Health (e.g., Social Work, Gerontology, Psychology, etc.). Interprofessional courses cannot include any with the HLTH, HADM, or HCIP prefix (or any courses cross-listed with those prefixes) with some exceptions.

HLTH 5206 - Interprofessional Approaches to Suicide Prevention (3)

Capstone Experience (3 credit hours)

The MPH Capstone provides a culminating, integrative curricular experience for students enrolled in the MPH program by concentration.

HLTH 6230 - Community Health Practice Capstone (3)
 HLTH 6250 - Health Policy Capstone (3)
 HLTH 6280 - Epidemiology Capstone Course (3)

Degree Total = 45 Credit Hours

Advising

Students are assigned an academic advisor during their first semester of the program; advisor assignments are based on the student's declared concentration. Students are expected to meet with their advisors at least once per semester to plan their progression through the program. The MPH Program Director must approve any course substitutions or transfer credits.

Assistantships

Positions as a graduate assistants or teaching assistants may be available. Research assistantships may be available as well, and are competitively awarded. Assistantships pay a stipend, which may vary. Students seeking assistantships should contact the MPH Program Director for additional information.

Financial Aid/Financial Assistance

Financial aid and assistance is available to qualifying students. Consult the Financial Aid and Loans section of the Niner Central website for information about the opportunities that are available, and how to apply.

Program Certifications/Accreditations

The MPH Program is fully accredited by the Council on Education for Public Health (CEPH). The Department of Epidemiology and Community Health is a member of the Association of Schools and Programs of Public Health (ASPPH). Students completing the MPH Program are eligible to sit for the Certified in Public Health (CPH) credentialing exam administered by the National Board of Public Health Examiners. Students completing the MPH Community Health Practice concentration are eligible to take the Certified Health Education Specialist (CHES) examination administered by the National Commission for Health Education Credentialing (NCHEC); students completing alternate concentrations also may be eligible to sit for the CHES examination.

MPH/M.A. in Anthropology Dual Degree

This dual degree program combines public health practice and applied anthropological methods for students interested in having a public health anthropology focus. The degree consists of 63 credit hours (80% of the 45

credit hours required for the Master of Public Health [36] and 81% of the 33 credit hours required for the Master of Arts in Anthropology [27]). The time to degree completion for full time students is 3 years (6 Fall/Spring semesters plus 1 Summer semester).

For the MPH, students complete the 5 core courses (15 credit hours), the 3 credit hour applied learning experience, or internship, as well as the 18 credit hours associated with one of the MPH concentrations: Community Health Practice, Health Policy, Physical Activity and Nutrition, or Epidemiology. For the M.A. in Anthropology, students complete 15 core credit hours with a focus on theory and ethnographic methods and then complete the 18 credit hour practicum option.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Public Health, MPH and Anthropology, M.A. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Public Health, MPH and Anthropology, M.A.) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Public Health, MPH

The Public Health, MPH program allows 9 credit hours to be shared from Anthropology, M.A. as follows:

Degree Requirement(s)	ANTH Course(s) Allowed	Credits
Cross-Cutting Elective	ANTH 6601	3
Restricted Elective	ANTH 6603	3
Interprofessional Elective	ANTH 6611	3

Anthropology, M.A.

Note: Dual degree students must select the Medical Anthropology concentration. The Anthropology, M.A. program allows 6 credits to be shared from Public Health, MPH as follows:

Degree Requirement(s)	ANTH Course(s) Allowed	Credits
Elective	HADM 6100	3
ANTH 6400 Practicum	HLTH 6471	3

Dual Degree Total = 63 Credit Hours

Other Requirements

Students complete a combined internship and research-based report with an appropriate and approved community-based entity.

Grade Requirements

Students are required to maintain an overall GPA of 3.0.

MPH/M.S. in Health Informatics and Analytics Dual Degree

The Master of Public Health (MPH) and Master of Science (M.S.) in Health Informatics and Analytics (HIA) dual degree program allows students to develop as public health practitioners who are grounded in data science and health analytics. Enrolled students earn both a MPH and a M.S. in Health Informatics and Analytics (HIA) degree typically with a concentration in Health Services Outcomes.

Typically for the MPH, students complete 5 core courses (15 credit hours), an applied learning experience, or internship (3 credit hours), as well as 6 required courses related to one of the MPH concentrations (18 credit hours): Community Health Practice, Health Policy, Physical Activity and Nutrition, or Epidemiology.

For the M.S. in HIA, students complete 2 foundational courses (6 credit hours), 4 core courses (12 credit hours), 3 selective courses (9 credit hours), 2 restricted elective courses (6 credit hours), and a culminating experience (3 credit hours).

For students completing the MPH with a concentration in Epidemiology, 12 credit hours are shared in the dual degree program. These students earn the dual degree in 60, instead of 81, credit hours. Students enrolled in other MPH concentrations complete the dual degree in 63 credit hours, with 9 shared credit hours.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See Public Health, MPH and Health Informatics and Analytics, M.S. sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Public Health, MPH and Health Informatics

and Analytics, M.S.) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Public Health, MPH, Epidemiology

The Public Health, MPH program with a concentration in Epidemiology allows 12 credits to be shared from Health Informatics and Analytics, M.S. as follows:

Degree Requirement(s)	HIAN Course(s) Allowed	Credits
HADM 6100	HADM 6100	3
HCIP 6102	HCIP 6102	3
Restricted elective	HCIP selective	3
Cross-cutting elective	HCIP selective	3

Public Health, MPH, Other Concentrations

The Public Health, MPH program with a concentration in Community Health, Health Policy, or Physical Activity & Nutrition allows 9 credits to be shared from Health Informatics and Analytics, M.S. as follows:

Degree Requirement(s)	HIAN Course(s) Allowed	Credits
HCIP 6100	HADM 6100	3
Restricted elective	HCIP selective	3
Cross-cutting elective	HCIP selective	3

Health Informatics and Analytics, M.S.

The Health Informatics and Analytics, M.S. program allows 9 credits to be shared from Public Health, MPH as follows:

Degree Requirement(s)	MPH Course(s) Allowed	Credits
Electives	One of the following: HLTH 6226, HTLH 6241, HLTH 6271, HLTH 6277	3
Electives	Any MPH concentration course	3
Electives	Interprofessional elective	3

Note: Other HLTH courses may also be considered as HCIP electives with agreement by the Program Director.

MPH Internship (3 credit hours)

Students pursue an internship relevant to both Public Health and Health Informatics and Analytics.

HLTH 6471 - Public Health Internship (3)

HIA Culminating Experience (3 credit hours)

Students complete the team-based problem-solving course for the HIA program:

HCIP 6250 – Capstone: Problem-Solving in Healthcare Analytics (3)

Dual Degree Total = 60 Credit Hours
(Epidemiology)

Dual Degree Total = 63 Credit Hours (MPH
Other Concentrations)

HEALTH MANAGEMENT AND POLICY

- Master of Health Administration (MHA)
- MHA/MBA Dual Degree (*see the Belk College of Business section*)
- MHA/M.S. in Health Informatics and Analytics Dual Degree
- MPH in Health Policy [*See Master of Public Health (MPH) program*]

Department of Health Management and Policy
hmp.charlotte.edu

Master of Health Administration (MHA)

The Master of Health Administration (MHA) program develops emerging healthcare leaders prepared to advance health equity and well-being.

This mission is pursued through education, research, and service that:

- 1) Gives students the knowledge, skills, and values needed to lead dynamic health systems.
- 2) Creates knowledge needed to lead people and organizations providing health services.
- 3) Increases the diversity of health services leaders, with a special emphasis on individuals and groups historically underrepresented in graduate education.
- 4) Promotes the public's health.

Vision Statement

The Master of Health Administration program is to be nationally recognized for developing emerging healthcare leaders who promote healthy communities partnered with responsive population health systems.

Job Opportunities

Master's prepared health services managers may work as chief or executive administrator, assistants to chief executives, or as directors and managers of departments and units. Examples of the settings where MHA graduates work include: hospitals and hospital systems, physician practices and clinics, long-term care facilities, managed care organizations, consulting firms, pharmaceutical and

biotechnology companies, local/state/federal health agencies, health insurance companies, and medical supply and equipment manufacturers.

Admission Requirements

Applicants are invited from a variety of undergraduate degree specializations who share in the program's mission and vision.

A portfolio approach is used to evaluate applicants. An applicant's portfolio consists of reference letters, previous professional experience (resume), goal statement, and transcripts (undergraduate and previous graduate work, if applicable). The portfolio approach allows for a holistic assessment of applicants for potential success in the program. Applicants should have a cumulative GPA of at least a 3.0, or make a compelling case for their capacity as part of their essay (goal statement).

Expectations

In meeting the application requirements set forth by the Graduate School, applicants are expected to:

- Provide a resume as part of their application materials
- Have mastered basic computer skills, including word processing and use of spreadsheets
- Select recommenders who can reflect on their prior academic and/or professional performance and capability for success in the graduate program
- Convey their demonstrated and potential capacity for verbal, quantitative, and analytical reasoning through their transcripts, statement of purpose, and letters of recommendation
- Applicants should consider potential gaps in such evidence when preparing their statements and soliciting letters of recommendation to put forth a compelling case in support of their admission.

Applicants are encouraged to review the competitive profile of our applicants and to consult with the MHA Program Director if concerned about meeting expectations.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

Each student is required to complete a total of 51 credit hours, including 45 credit hours (15 courses, including the Internship) in the core curriculum. These courses offer a

basic body of knowledge, skills, and values relevant to health services administration. Additionally, students select 6 credit hours (2 graduate courses) in elective studies.

Core Courses (42 credit hours)

HADM 6100 - Introduction to the U.S. Healthcare System (3)
 HADM 6104 - Health and Disease (3)
 HADM 6108 - Decision Analysis in Healthcare (3)
 HADM 6116 - Accounting for Healthcare Management (3)
 HADM 6120 - Health Economics (3)
 HADM 6124 - Marketing in Healthcare (3)
 HADM 6128 - Human Resources Management (3)
 HADM 6134 - Quality and Outcomes Management in Healthcare (3)
 HADM 6138 - Healthcare Finance (3)
 HADM 6142 - Health Policy Development (3)
 HADM 6145 - Organization Behavior in Healthcare (3)
 HADM 6146 - Information Resources Management (3)
 HADM 6150 - Health Law and Ethics (3)
 HADM 6154 - Strategic Management of Health Services Organizations (3)

Internship (3 credit hours)

Each student in the program is required to apply classroom lessons in practice through an approved internship. Proof of immunizations, a criminal background check, and a drug screen are among commonly imposed internship requirements. Students who are unable to be placed in an internship face dismissal from the program.

HADM 6400 Health Administration Internship (3)

Elective Courses (6 credit hours)

Students should select two elective courses that complement their professional interest and educational goals. Elective courses are available in a variety of areas, including health informatics and analytics, management specialties, long-term care, community health, and nonprofit organization. Students may choose from elective courses offered by the program or avail themselves of any graduate offerings from across the University that may be open to them. Sample courses include:

HADM 6200 - Health Insurance and Managed Care (3)
 HADM 6210 - Medical Practice Management (3)
 HADM 6234 - Performance Improvement Project Management in Healthcare: An Introduction to Lean Six Sigma (3)
 GRNT 6211 - Administration of Aging Programs (3)
 SOCY 6138 - Social Organization of Healthcare (3)

Degree Total = 51 Credit Hours

Advising

Each student is assigned a faculty advisor. In addition, the MHA Program Director serves as the back-up advisor for all students. Registration for MHA courses is by permission only and follows a proscribed sequence. Consequently, students are required to meet with their advisor on a regular basis to plan their progression through their program of study. Course substitutions are sparingly allowed and must be approved by the MHA Director in advance.

Assistantships

Positions as graduate teaching assistants or student temporary hires (formerly known as graduate administrative assistants) may be available. Grant-funded research assistantships may be available as well. Students seeking assistantships should contact the MHA Program Director.

Financial Aid/Financial Assistance

A wide range of opportunities for financial aid/assistance is available to qualifying students, which may be accessed through the Office of Student Financial Aid. See the Financial Information section of this Catalog for more information on the opportunities that are available, and how to contact the Office of Student Financial Aid.

MHA/MBA Dual Degree

This dual degree program allows students to earn a Master of Health Administration (MHA) degree from the College of Health and Human Services and a Master of Business Administration (MBA) degree from the Belk College of Business. For details, see the Belk College of Business section of this *Catalog*.

MHA/M.S. in Health Informatics and Analytics Dual Degree

The Master of Health Administration (MHA) and Professional Science Master's in Health Informatics and Analytics (HIA PSM) dual degree program allows students to earn both a Master of Health Administration and a M.S. in Health Informatics and Analytics degree. The MHA and HIA PSM dual degree program (outlined below) consists of 66 credit hours of coursework, in contrast to the 87 credit hours required if these degrees were pursued separately.

Admission Requirements

Students must apply to each program separately and be admitted to both programs by the published census date of the third semester (including Summer). No admission requirements established by the Graduate School or by either individual program may be waived. See (Health Administration, MHA and Health Informatics and Analytics,

M.S.) sections of this catalog for individual program admission requirements.

Dual Degree Requirements

Dual degree students must satisfy all individual degree requirements (Health Administration, MHA and Health Informatics and Analytics, M.S.) with the added benefit of sharing a limited number of credits between the two programs. See the Shared Courses section below for permissible course sharing.

Shared Courses

Health Administration, MHA

The Health Administration, MHA program allows 9 credits to be shared from Health Informatics and Analytics, M.S. as follows:

Degree Requirement(s)	HIAN Course(s) Allowed	Credits
HADM 6108 - Decision Analysis in Healthcare	HCIP 6108 - Intermediate Decision Analysis in Healthcare	3
Elective	Any HCIP elective	3
Elective	Any HCIP elective	3

Health Informatics and Analytics, M.S.

The Health Informatics and Analytics, M.S. program allows 9 credits to be shared from Health Administration, MHA as follows:

Degree Requirement(s)	MHA Course(s) Allowed	Credits
HADM 6100 – Introduction to the U.S. Healthcare System	HADM 6100 – Introduction to the U.S. Healthcare System	3
Elective	HADM 6134 - Quality and Outcomes Management in Healthcare	3
Elective	HADM 6104 - Population Health and Disease	3

Note: HADM 6100 counts as a Health Administration course for the purpose of the dual degree. Other HADM courses may also be considered as HIAN electives with agreement by program director.

Capstone Courses (6 credit hours)

Complete both programs' respective capstone courses. For the HIA MS program choose either HCIP 6250 or HCIP 6400.

HADM 6154 - Strategic Management of Health Services Organizations (3)
 HCIP 6250 - Problem-Solving in Healthcare Analytics (3)
 HCIP 6400 - Health Informatics and Analytics Internship Project (3)

Degree Total = 69 Credit Hours

NURSING

- **Doctor of Nursing Practice (DNP)**
 - Post-Master's
 - Nurse Anesthesia Across the Lifespan
- **Master of Science in Nursing (MSN)**
 - Adult-Gerontology Acute Care Nurse Practitioner
 - Community/Public Health Nursing
 - Family Nurse Practitioner Across the Lifespan
 - Nurse Administrator
 - Nurse Educator
- **Graduate Certificate in Nursing**
 - Applied Nursing Informatics
 - Nurse Administrator
 - Nurse Educator
- **Post-Master's Certificate in Nursing**
 - Adult-Gerontology Acute Care Nurse Practitioner (AGACNP)
 - Family Nurse Practitioner Across the Lifespan

School of Nursing
nursing.charlotte.edu

Doctor of Nursing Practice (DNP) – Post-Master's

The Post-Master's Doctor of Nursing Practice (DNP) degree prepares graduates to analyze systems of care and provide transformational leadership to improve patient safety, quality of care, and implement evidence-based culturally competent care practices. Graduates from this program are able to interpret and apply research findings to practice settings, determine and measure system and population outcomes, manage information systems, and use appropriate technology for health and risk communication.

Upon completion of the DNP program, graduates are able to:

- Analyze and integrate evidence from nursing science with evidence from other relevant scientific disciplines to form a scientific foundation for advanced practice in nursing.
- Apply clinical scholarship, scientific evidence, and analytical methods to improve health care outcomes.
- Develop and evaluate systems to enhance safety and quality of healthcare.
- Advocate and participate in collaborative interdisciplinary efforts to improve health outcomes at the practice/organization, community, state, and national levels.
- Engage in culturally competent and ethically sound advanced nursing practice.
- Demonstrate leadership in the improvement of patient outcomes and transformation of health care delivery.
- Manage directly the complex problems of clients/populations and systems to facilitate access and navigation of the health care system to improve health outcomes.

Courses are primarily taught online with a few days of campus immersion each semester. Students are expected to travel to campus and participate in campus immersion activities when scheduled.

Admission Requirements

- An overall GPA of at least 3.5 (on a 4.0 scale) in the MSN program as documented by official transcripts
- Earned master's or higher degree in nursing in an advanced nursing practice specialty from a college or university accredited by an accepted accrediting body
- Current RN licensure in the U.S. at time of application with eligibility for NC licensure; NC licensure must be obtained prior to clinical practice experiences in NC
- GRE/MAT scores are not required for applicants to the Post-Master's DNP Program.
- Advanced Practice Registered Nurses (APRNs) must provide evidence of current national certification and meet the state requirements for practice in their state of licensure
- An essay that addresses: 1) advanced practice expertise, 2) career goals, 3) how earning the DNP degree will foster achievement of these goals, and 4) plans for DNP project
- Resume/curriculum vitae
- Three professional recommendations that address the practice capabilities of the candidate
- For international students: submission of TOEFL scores with a minimum score of 557 for the paper test and 83 Internet-based test
- Additional evidence for consideration of the application can be uploaded (e.g., publications, posters, evidence-based practice projects)
- Evidence of 500 supervised clinical hours within the MSN program (to be completed by MSN program officials); applicants who do not meet the clinical hours criteria can meet with the DNP Coordinator to discuss a plan to meet the requirement
- Faculty interview with qualified applicants
- UNC Charlotte School of Nursing will not admit a student with a master's in nursing education unless they are pursuing a clinical practice/advanced practice role; specifically, Nurse Practitioners, Nurse Midwifery, Nurse Anesthetist, Clinical Nurse Specialist, Clinical Nurse Leaders or Nurse Informaticists

Degree Requirements

The DNP program requires 42 post-master's graduate credit hours and completion of a total of 1000 clinical practice hours (includes 500 hours from the MSN program).

Core Courses (18 credit hours)

NUDN 8140 - Foundations and Applications of Evidence-Based Practice (3)
 NUDN 8145 - Leadership and Project Planning (3)
 NUDN 8202 - Community Epidemiology (3)
 NUDN 8220 - Healthcare Policy and Ethics (3)
 NUDN 8230 - Economic and Financial Aspects of Healthcare System (3)
 NUDN 8270 - Technology for Communication and Transforming Healthcare (3)

Concentration Courses

Theory Courses (9 credit hours)

NUDN 8160 - Issues in Global Health (3)
 NUDN 8260 - Leadership and Healthcare Systems (3)
 Graduate Elective Course (3)*

**The Graduate Elective Course may be selected from Nursing courses, but any graduate level course is acceptable.*

Methods Courses (6 credit hours)

NUDN 8147 - Applied Biostatistics (3)
 NUDN 8150 - Principles of Quality Improvement for Patients, Systems, and Safety (3)

Residency and Project Courses (9 credit hours)

NUDN 8441 - Clinical Residency and Project Development I (2)
 NUDN 8442 - Clinical Residency and Project Development II (2)
 NUDN 8443 - Clinical Residency and Project Development III (3)
 NUDN 8444 - Clinical Residency and Project Development IV (2)

Degree Total = 42 Credit Hours

Grade Requirements

An accumulation of three C grades in any graduate coursework will result in suspension of the student's enrollment. If a student makes a grade of U or N in any credit-bearing graduate course, enrollment will be suspended.

Clinical Residency and DNP Scholarly Project

The Professional Doctorate Scholarly Practice Project prepares students to 1) synthesize knowledge gained from

their educational experience and 2) apply leadership skills in implementing a clinically focused practice or quality improvement project in a clinical setting consistent with the professional degree educational standards. The practice project is completed in a clinical practice setting approved by the Doctoral Program Director following guidelines established by the individual program.

Doctoral Scholarly Projects are developed and completed through a 4-course series spanning four semesters. The course faculty serves as the student(s) project chair. The doctoral projects focus on improving clinical practice and are done in conjunction with a clinical site. Projects are evaluated by an advisory committee that includes the chair, an expert from the clinical site, and one additional full-time faculty member academically prepared in the program's specialty focus. The clinical expert's role is to assist the student in accessing the necessary clinical site resources, mentoring the student in the clinical area, and providing feedback to the chair and student regarding the student's project. The chair is responsible for directing the students' progress toward completion of the project and evaluating the project outcome in consultation with the advisory committee. Students work with their chair to identify advisory committee members in the second year of the program and in the first year of the Post-Master's DNP program.

Students identify a clinical practice problem in collaboration with the chair and advisory committee, propose a workplan for a quality improvement project related to the clinical problem, implement the project, and disseminate the outcome(s). If the project requires approval from the University's Institutional Review Board (IRB), a research protocol application must be submitted for approval prior to implementing the project. All students will present an oral presentation and submit a written project outcomes report. The oral examination is met through presenting the project to an audience, which can include a verbal or poster presentation to a professional meeting, a clinical organization, or to an audience of students and faculty. The written report will conform to the SQUIRE guidelines for reporting quality improvement initiatives. The chair, with input from the advisory committee, provides feedback on the quality improvement workplan and evaluates the final project presentation. After successful completion, a copy of the written report will be submitted to Atkins Library's Niner Commons. The Project Completion Form is submitted to the Graduate School at the completion of the project.

Projects may be completed as individual projects or in groups of two or three based on the type of project proposed, the clinical issue being addressed, and approval by the chair. Projects completed in small groups must share the same goals and objectives and be designed and conducted across different practice settings or population

groups so that each student provides their own unique contribution to the overall project implementation. Each student's contribution should be able to stand on its own in the event other students in the group are unable to complete their portion of the project. Students will present their implementation design to the course faculty and chair with input from the advisory committee before being allowed to proceed with the project. Students working in groups will present their oral and written presentations as a group.

Students and faculty working on projects, are encouraged to use resources such as the Authorship Agreement available through UNC Charlotte's Authorship Project (<https://www.authorshipproject.org/>) in outlining student's and faculty roles in the project and through its dissemination.

Advisory Committee

All students must have an advisory committee to evaluate their doctoral scholarly project. This committee includes the chair, an expert from the clinical site, and one additional full-time faculty member academically prepared in the program's specialty focus. Faculty serving on the advisory committee must hold terminal degrees and be eligible to be appointed as Regular or Associate members of the Graduate Faculty. The Chair must be a full-time faculty member within the doctoral program.

Details regarding the scholarly project are available in the *DNP Student Handbook*.

Student Handbooks

The policies and procedures guiding the program, progression, and expectations can be found in the *Graduate Student* and *DNP Student Handbooks*.

Time Limits for Degree Completion

All graduation requirements must be completed within 6 years after enrollment in the first course.

Transfer Credit

DNP students may transfer up to 6 graduate credit hours (with a grade of B or above) with approval of the DNP Graduate Program Director. No course being transferred may be older than 6 years at the time of graduation or have counted toward completion of another degree.

Doctor of Nursing Practice (DNP) – Nurse Anesthesia Across the Lifespan

The Nurse Anesthesia Across the Lifespan is a post-baccalaureate DNP concentration requiring a BSN to

apply. It provides students both the theory and clinical practice required to meet the educational requirements to take the national certifying examination upon graduation. The specialty in Nurse Anesthesia Across the Lifespan is offered in partnership with Carolinas Medical Center. Clinical experiences are offered at Atrium Health facilities in the Charlotte area. This program is full-time, campus-based, and can be completed in 9 semesters. Students are admitted once per year and begin their program of study in the summer semester. Interviews are conducted for the top candidates two times per academic year. Application is required at both UNC Charlotte and Carolinas Medical Center School of Nurse Anesthesia. All application materials must be received prior to the published deadline.

The Doctor of Nursing Practice (DNP) is the terminal practice degree in Nursing. The DNP prepares students to practice in an advanced clinical role and provide leadership in a dynamic healthcare system. Graduates of the program will be able to analyze systems of care and provide leadership to improve patient safety and quality of care and to implement evidence-based, culturally competent care. Visit nursing.charlotte.edu and atriumhealth.org/education/Graduate-Medical-Education/School-of-Nurse-Anesthesia for information on application deadlines and program metrics.

Admission Requirements

- Hold a current unrestricted RN licensure in the U.S. at the time of application with eligibility for NC licensure
- Earned Baccalaureate Degree in Nursing (BSN) from a college or university accredited by an accepted accrediting body
- Graduate Record Exam (GRE) scores no older than 5 years; a minimum combined score of 293 on the verbal and quantitative sections is recommended (MAT scores are not accepted)
- A minimum GPA of 3.3 on a 4.0 scale for all undergraduate work after high school
- A minimum GPA of 3.3 on a 4.0 scale for all basic undergraduate science courses taken since high school (e.g., Chemistry, Biology, Anatomy and Physiology, and Microbiology)
- Completion of an undergraduate statistics course with a grade of B or above
- An essay (statement of purpose) limited to a single page, describing the applicant's experience, fit to the CRNA role, and examples of leadership; candidates should highlight unique characteristics such as being bilingual and leadership experiences
- Three letters of recommendation from persons familiar with the applicant's professional qualifications, one letter must be from the applicant's clinical manager; others can include colleagues, academic professors, or physicians

- A minimum 18 months of current full-time critical care experience with adult patients is required prior to matriculation; Acceptable experience includes: Intensive Care Unit, Coronary Care Unit, Trauma Intensive Care Unit, Neuro Intensive Care Unit, Surgical Intensive Care Unit, Cardiovascular Intensive Care Unit. Experiences that are not acceptable include: Flight Team, Emergency Room, Pediatric Intensive Care Unit, Neonatal Intensive Care, Post Anesthesia Care, and Operating Room
- Current certification in Basic Cardiac Life Support, Advanced Cardiac Life Support, and Pediatric Advanced Life Support with documentation provided only to Carolinas Medical Center Nurse Anesthesia Program application
- Interviews are required for the top-scoring applicants who meet the admission requirements. Top scoring applicants will be invited for an interview with the Program's Admissions Committee. Only after a successful interview, will applicants be offered admission.
- Professional resume
- The application process requires two applications - one to UNC Charlotte and one to Carolina's Medical Center

Degree Requirements

The Nurse Anesthesia Across the Lifespan DNP program requires completion of 89 credit hours of approved courses, completion of a minimum of 2000 clinical practice hours, and completion of the Scholarly Project. Only full-time study is available. All courses are offered once a year and must be taken in sequence.

Core Courses (18 credit hours)

NUDN 8140 - Foundations and Applications of Evidence-Based Practice (3)
 NUDN 8145 - Leadership and Project Planning (3)
 NUDN 8202 - Community Epidemiology (3)
 NUDN 8220 - Healthcare Policy and Ethics (3)
 NUDN 8230 - Economic and Financial Aspects of Healthcare System (3)
 NUDN 8270 - Technology for Communication and Transforming Healthcare (3)

Concentration Courses

Theory Courses (25 credit hours)

NUAN 8154 - Advanced Pharmacology of Non-Anesthetic Agents (4)
 NUAN 8155 - Advanced Pharmacology of Anesthetic Agents (4)
 NUAN 8156 - Applied Physics and Chemistry in Nurse Anesthesia (3)
 NUAN 8157 - Advanced Pathophysiology in Nurse Anesthesia I (3)
 NUAN 8158 - Advanced Pathophysiology in Nurse Anesthesia II (3)

NUAN 8171 - Professional Aspects of Nurse Anesthesia (3)
 NUAN 8172 - Nurse Anesthesia Review (2)
 NURS 6273 - Advanced Human Physiology (3)

Methods Courses (21 credit hours)

NUAN 8161 - Principles of Nurse Anesthesia I (3)
 NUAN 8162 - Principles of Nurse Anesthesia II (3)
 NUAN 8163 - Principles of Nurse Anesthesia III (3)
 NUAN 8164 - Principles of Nurse Anesthesia IV (3)
 NUDN 8302 - Responsible Conduct of Research and Scholarship in Nursing Practice (2)
 NURS 6230 - Advanced Health Assessment and Diagnostic Reasoning for Advanced Practice (3)
 NURS 6430 - Advanced Health Assessment and Diagnostic Reasoning Practicum (1)
 STAT 6127 - Introduction to Biostatistics (3)

Clinical Residency Courses (19 credit hours)

NUAN 8484 - Clinical Residency in Nurse Anesthesia I (1)
 NUAN 8485 - Clinical Residency in Nurse Anesthesia II (2)
 NUAN 8486 - Clinical Residency in Nurse Anesthesia III (4)
 NUAN 8487 - Clinical Residency in Nurse Anesthesia IV (4)
 NUAN 8488 - Clinical Residency in Nurse Anesthesia V (4)
 NUAN 8489 - Clinical Residency in Nurse Anesthesia VI (4)

Scholarly Project Courses (6 credit hours)

NUDN 8641 - Project Development I (1)
 NUDN 8642 - Project Development II (2)
 NUDN 8643 - Project Development III (1)
 NUDN 8644 - Project Development IV (2)

Clinical Requirements

Students are required to successfully complete a minimum of 2000 hours of supervised clinical. Atrium Health provides clinical instruction for students enrolled in the nurse anesthesia program. The primary location for clinical is Carolinas Medical Center, an 850-bed Level-1 Trauma Center and regional referral center for North and South Carolina. The medical center and teaching hospital provides students state-of-the-art clinical facilities and access to patients undergoing a variety of complex surgical and diagnostic procedures. All facilities provide a preceptor-to-student ratio of no more than 1 to 2 with a CRNA and/or physician anesthesiologist. The clinical hours and number and variety of cases are exceptional; students far exceed the number of clinical hours and cases required for certification.

Degree Total = 89 Credit Hours

Grade Requirements

An accumulation of two C grades in any required coursework or any grade of C or below in any NUAN course will result in suspension of the student's enrollment. Students must successfully pass the Scholarly Project proposal defense and the Scholarly Project defense in order to graduate. Graduate students must have a 3.0

GPA in the courses on their degree plan of study in order to graduate.

DNP Scholarly Project

Scholarly Project

The Professional Doctorate Scholarly Practice Project prepares students to 1) synthesize knowledge gained from their educational experience and 2) apply leadership skills in implementing a clinically focused practice or quality improvement project in a clinical setting consistent with the professional degree educational standards. The practice project is completed in a clinical practice setting approved by the Doctoral Program Director following guidelines established by the individual program.

Doctoral Scholarly Projects are developed and completed through a 4-course series spanning four semesters. The course faculty serves as the student(s) project chair. The doctoral projects focus on improving clinical practice and are done in conjunction with a clinical site. Projects are evaluated by an advisory committee that includes the chair, an expert from the clinical site, and one additional full-time faculty member academically prepared in the program's specialty focus. The clinical expert's role is to assist the student in accessing the necessary clinical site resources, mentoring the student in the clinical area, and providing feedback to the chair and student regarding the student's project. The chair is responsible for directing the students' progress toward completion of the project and evaluating the project outcome in consultation with the advisory committee. Students work with their chair to identify advisory committee members in the second year of the program and in the first year of the Post-Master's DNP program.

Students identify a clinical practice problem in collaboration with the chair and advisory committee, propose a workplan for a quality improvement project related to the clinical problem, implement the project, and disseminate the outcome(s). If the project requires approval from the University's Institutional Review Board (IRB), a research protocol application must be submitted for approval prior to implementing the project. All students will present an oral presentation and submit a written project outcomes report. The oral examination is met through presenting the project to an audience, which can include a verbal or poster presentation to a professional meeting, a clinical organization, or to an audience of students and faculty. The written report will conform to the SQUIRE guidelines for reporting quality improvement initiatives. The chair, with input from the advisory committee, provides feedback on the quality improvement workplan and evaluates the final project presentation. After successful completion, a copy of the written report will be submitted to Atkins Library's Niner Commons. The

Project Completion Form is submitted to the Graduate School at the completion of the project.

Projects may be completed as individual projects or in groups of two or three based on the type of project proposed, the clinical issue being addressed, and approval by the chair. Projects completed in small groups must share the same goals and objectives and be designed and conducted across different practice settings or population groups so that each student provides their own unique contribution to the overall project implementation. Each student's contribution should be able to stand on its own in the event other students in the group are unable to complete their portion of the project. Students will present their implementation design to the course faculty and chair with input from the advisory committee before being allowed to proceed with the project. Students working in groups will present their oral and written presentations as a group.

Students and faculty working on projects, are encouraged to use resources such as the Authorship Agreement available through UNC Charlotte's Authorship Project (<https://www.authorshipproject.org/>) in outlining student's and faculty roles in the project and through its dissemination.

Advisory Committee

All students must have an advisory committee to evaluate their doctoral scholarly project. This committee includes the chair, an expert from the clinical site, and one additional full-time faculty member academically prepared in the program's specialty focus. Faculty serving on the advisory committee must hold terminal degrees and be eligible to be appointed as Regular or Associate members of the Graduate Faculty. The Chair must be a full-time faculty member within the doctoral program.

Details regarding the scholarly project are available in the *DNP Student Handbook*.

Student Handbooks

The policies and procedures guiding the program, progression, and expectations can be found in the *Graduate Student* and *DNP Student Handbooks*. Clinical concentrations may have additional handbooks related to clinical performance and expectations.

Time Limits for Degree Completion

All graduation requirements must be completed within 6 years after enrollment in the first course.

Transfer Credit

DNP students may transfer up to 6 graduate credit hours (with a grade of B or above) with approval of the DNP Graduate Program Director. No course being transferred may be older than 6 years at the time of graduation.

Master of Science in Nursing (MSN)

The Commission on Collegiate Nursing Education (CCNE) accredited Master of Science in Nursing degree is designed to prepare nurses for advanced practice in Advanced Clinical Nursing or Systems/Populations Nursing. Active concentrations in Advanced Clinical Practice include Family Nurse Practitioner Across the Lifespan and Adult-Gerontology Acute Care Nurse Practitioner. Inactive concentrations include: Concentrations in Systems/Population; Community/Public Health Nursing; Nurse Administrator; and Nurse Educator. Three post-master's certificates are available: Nurse Anesthesia Across the Lifespan, Adult-Gerontology Acute Care Nurse Practitioner, and Family Nurse Practitioner Across the Lifespan. Two graduate certificates are available: Nurse Administrator and Nurse Educator. Offerings of specific concentrations are dependent on sufficient enrollment. Each concentration is individually described.

Graduates of the program will be eligible to take the American Nurses Credentialing Center (ANCC) advanced examination for relevant specialties and/or other professional certification exams.

Concentrations

- **Advanced Clinical Nursing Concentration(s)**
 - Adult-Gerontology Acute Care Nurse Practitioner
 - Family Nurse Practitioner Across the Lifespan
- **Systems/Population Nursing Concentration(s)**
 - Nurse Administrator
 - Community/Public Health Nursing
 - Nurse Educator

Admission and Progression Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Nursing (*see additional requirements for specific concentration*).

- 1) Current unrestricted licensure as a Registered Nurse; current license in North Carolina or a compact state or the state identified by faculty for clinical practice before enrollment
- 2) Baccalaureate degree from a college or university accredited by an accepted accrediting body. If the degree is not in Nursing and courses in Research, Leadership/Management, Aging and Health and Community Health are lacking, they will be required as part of the program of study (option available only

- to Nurse Administration, Community/Public Health Nursing, and Nurse Educator concentrations).
- 3) Satisfactory performance on the Graduate Record Examination or the Miller Analogies Test or a previous Graduate degree with documentation of test scores
- 4) One year of professional nursing practice is recommended
- 5) An essay (statement of purpose) describing the applicant's experience and objective in undertaking graduate study in the chosen concentration
- 6) Overall GPA of at least 3.0 in the last degree earned
- 7) Completion of a statistics course with a grade of C or above
- 8) See concentration admission requirements for application dates that vary from those published by the Graduate School

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree (Advanced Clinical Nursing and Systems/Populations Nursing only) before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The MSN degree requires completions of 36 to 67 graduate credit hours, depending on the concentration. All concentrations require a Capstone Project. Specific requirements and prerequisites for each specialty are listed below. Nurse Practitioner and Nurse Anesthesia are designed to accommodate full-time study. Part-time study is available for some concentrations. Many classes are held in the late afternoon or evening.

Up to a total of six graduate credit hours may be accepted from another college or university accredited by an accepted accrediting body or from a post-baccalaureate program at UNC Charlotte. All courses must be approved prior to transfer by the student's advisor, the Associate Director of the Graduate Division, and the Dean of the Graduate School. All coursework, including accepted transfer credits, must be completed within a six-year period prior to graduation.

Assistantships

A limited number of graduate assistantships are available. Information is available in the School of Nursing, and from the Associate Dean for Academic Affairs, College of Health and Human Services.

Additional Financial Aid

Scholarships from the North Carolina Nurse Scholars Program – Master's Program (M-NSP) are available to

part-time or full-time students admitted to the nursing program for up to two years of study. The M-NSP scholarships are competitive and preference will be given to full-time students. Awards are not based on financial need. The application deadline is early May. Further information and application forms are available on the School of Nursing webpage for Student Resources or in the College of Health and Human Services Advising Center.

A limited number of Professional Nurse Traineeships are available to full-time nurse practitioner students. The traineeship awards fund a portion of tuition and fees. Further information and application forms are available from the School of Nursing.

Advanced Clinical Specialties

Master of Science in Nursing (MSN) – Adult-Gerontology Acute Care Nurse Practitioner (AGACNP)

These advanced practice registered nurses are prepared to function as Adult-Gerontology Acute Care Nurse Practitioners (AGACNP). Adult-Gerontology Acute Care Nurse Practitioners provide evidence-based care to acutely ill adults with urgent and emergent complex health issues and critically ill adults with life threatening, rapidly changing physiological and pathophysiological conditions. Graduates with this concentration are eligible to take the American Nurses Credentialing Center (ANCC) examination for Adult-Gerontology Acute Care Nurse Practitioners. The AGACNP program is a full-time, campus-based program.

Admission Requirements

- Unencumbered license as a Registered Nurse in North Carolina
- BSN degree from a college or university accredited by an accepted accrediting body; the RN-to-MSN option is not available to NP applicants
- Minimum of 12 months full-time nursing practice in acute care (ICU preferred) at the time of application
- Overall GPA of 3.0 on a 4.0 scale in the last degree earned
- Completion of an undergraduate statistics course with a grade of C or above

- Statement of Purpose explaining the applicant's career goal and preparation in relation to acute care nurse practitioner role and qualities making them a strong applicant (see the School of Nursing website at nursing.charlotte.edu for required elements of the Statement of Purpose) (Note: Statement of Purpose should not exceed two double-spaced typed pages.)
- References should be from professional colleagues and should speak to clinical knowledge and expertise and one's ability to function as a member of the healthcare team; at least one reference from a supervisory person is preferred
- ACLS certification required
- GRE is not required
- Interview may be required

Application is competitive. Students are admitted annually in the Fall semester. See the School of Nursing website at nursing.charlotte.edu for application deadline.

Degree Requirements

The program requires completion of 47 credit hours in approved courses including:

Core Courses (9 credit hours)

- NURS 6101 - Theoretical Basis for Nursing Practice (3)
- NURS 6160 - Research in Nursing and Health Professions (3)
- NURS 6115 - Health Policy and Planning in the U.S. (3)

Cognate Courses (6 credit hours)

- NURS 6274 - Advanced Human Pathophysiology (3)
- STAT 6127 - Introduction to Biostatistics (3)

Advanced Clinical Core (9 credit hours)

- NURS 6210 - Family Health in Advanced Practice Nursing (2)
- NURS 6220 - Pharmacotherapeutics in Advanced Nursing Practice (3)
- NURS 6230 - Advanced Health Assessment and Diagnostic Reasoning for Advanced Practice (3)
- NURS 6430 - Advanced Health Assessment Practicum (1)*

Concentration Courses (20 credit hours)

- NUNP 6202 - Complex Healthcare Management of Adults (3)
- NUNP 6203 - Advanced Care of Critically Ill Adults (3)
- NUNP 6250 - Advanced Primary Care and Health Promotion of Adults Across the Lifespan (3)
- NUNP 6401 - Advanced Care and Health Promotion Adults Practicum (2)*
- NUNP 6402 - Advanced Practice Nursing in Complex Care Practicum (4)*
- NUNP 6403 - Advanced Care of Critically Ill Adults Practicum (4)*
- NUNP 6431 - Advanced Acute Care Skills Lab (1)*

** Clinical Courses require 60 hours practice for each credit hour. Clinical courses may require travel to clinical sites outside Charlotte and Mecklenburg County.*

Capstone Course (3 credit hours)

NURS 6603 Synthesis in Advanced Nursing Practice (3)

Additional Requirements

- A minimum of 600 hours of supervised clinical experience as a Nurse Practitioner
- Enrollment will be suspended if the student receives a grade of C or below in any NUNP course. Graduate students must have a 3.0 GPA in the courses on their degree plan of study in order to graduate.
- Faculty advising

Degree Total = 47 Credit Hours

Grade Requirements

Students must maintain a GPA of 3.0. Additionally, in order to progress in the concentration, a grade of B or above is required in NURS 6220, NURS 6230, NURS 6274, and NURS 6430.

Post-Master's Certificate in Adult-Gerontology Acute Care Nurse Practitioner (AGACNP)

The Post-Master's Certificate consists of concentration courses in advanced practice nursing (minimum 20 graduate credit hours). This certificate program prepares nurses holding master's degrees in nursing to enter advanced practice nursing as an Adult-Gerontology Acute Care Nurse Practitioner. Nurses already certified as Psych NPs, Women's Health or Pediatric NPs are evaluated for possible exclusion of respective concentration courses and practica from their program. The recipients of this certificate are eligible to take the American Nurses Credentialing Center (ANCC) or American Academy of Nurse Practitioners (AANP) examination for Adult-Gerontology Acute Care Nurse Practitioners. Coursework must be completed within four years. The AGACNP program is a full-time, campus-based program.

Admission Requirements

- 1) A master's degree in nursing from a college or university accredited by an accepted accrediting body
- 2) Unencumbered North Carolina License as a Registered Nurse
- 3) Minimum overall GPA of 3.0 in MSN degree
- 4) Statement of Purpose explaining the applicant's career goal and preparation in relation to acute care nurse

practitioner role, and qualities making them a strong applicant (See School of Nursing website for required elements of the Statement of Purpose). (Note: *Statement of Purpose should not exceed two double-spaced typed pages.*)

- 5) References should be from professional colleagues and should speak to clinical knowledge and expertise and one's ability to function as a member of the healthcare team. At least one reference from a supervisory person is preferred.
- 6) Graduate Health Assessment course equivalent within the last 5 years**
- 7) Graduate Pharmacology course equivalent within the last 5 years**
- 8) Graduate Pathophysiology within the last 5 years**

***Nurses certified as Adult or Family, Psych, or Pediatric nurse practitioners may have these courses waived from the admission requirements after assessment of transcripts. Nurses with other backgrounds will be evaluated on an individual basis.*

Application is competitive. Students are admitted annually in the Fall semester. See the School of Nursing website at nursing.charlotte.edu for application deadline. Plan of Study is individualized based on course availability.

Certificate Requirements

- NUNP 6202 Complex Healthcare management of Adults (3)
- NUNP 6203 Advanced Care of Critically Ill Adults (3)
- NUNP 6250 Advanced Primary Care and Health Promotion of Adults Across the Lifespan (3)
- NUNP 6401 Advanced Care and Health Promotion Adults Practicum (2)***
- NUNP 6402 Advanced Practice Nursing in Complex Care Practicum (4)***
- NUNP 6403 Advanced Care of Critically Ill Adults Practicum (4)***
- NUNP 6431 Advanced Acute Care Skills Lab (1)***

Note: Nurses with other backgrounds will be evaluated on an individual basis.

**** Clinical Courses require 60 hours practice for each 1 credit hour. Clinical courses may require travel to clinical sites outside Charlotte and Mecklenburg County.*

Certificate Total = 20 Credit Hours

Additional Requirements

- A minimum of 600 hours of supervised clinical experience as a Nurse Practitioner
- Enrollment will be suspended if the student receives a grade of C or below in any NUNP course. Graduate students must have a 3.0 GPA

in the courses on their degree plan of study in order to graduate.

- Faculty advising is required.

Master of Science in Nursing (MSN) – Family Nurse Practitioner Across the Lifespan

This concentration leads to an MSN with a focus on Family Nurse Practitioner Across the Lifespan. The Family Nurse Practitioner program prepares nurses to function as Nurse Practitioners to provide care to families across the lifespan in primary care settings. Graduates of this program are eligible to take the American Nurses Credentialing Center (ANCC) or American Academy of Nurse Practitioners (AANP) examination for Nurse Practitioner Across the Lifespan certification. The MSN Family Nurse Practitioner program is a full-time, campus-based hybrid program.

Admission Requirements

- 1) Unencumbered license as a Registered Nurse in North Carolina or compact state
- 2) BSN from a college or university accredited by an accepted accrediting body
- 3) One year of professional nursing practice is preferred.
- 4) Overall GPA of 3.0 on a 4.0 scale in the last degree earned
- 5) Completion of an undergraduate statistics course with a grade of C or above
- 6) Statement of Purpose explaining the applicant's career goal and preparation in relation to primary care and family practice. Identify qualities that make them a strong applicant. (See the School of Nursing website at nursing.charlotte.edu for required elements of the Statement of Purpose). *The Statement of Purpose should not exceed two double-spaced typed pages.*
- 7) Three references should be from professional colleagues and should speak to clinical knowledge and expertise and one's ability to function as a member of the healthcare team. At least one reference must be from a supervisor.
- 8) GRE is not required

Application is competitive. Students are admitted annually in the Fall semester. See the School of Nursing website at nursing.charlotte.edu for application deadline.

Degree Requirements

Core Courses (9 credit hours)

- NURS 6101 - Theoretical Basis for Nursing Practice (3)
NURS 6160 - Research in Nursing and Health Professions (3)

NURS 6115 - Health Policy and Planning in the U.S. (3)

Cognate Courses (6 credit hours)

- NURS 6274 - Advanced Human Pathophysiology (3)
STAT 6127 - Introduction to Biostatistics (3)

Advanced Clinical Core (7 credit hours)

- NURS 6220 - Pharmacotherapeutics in Advanced Nursing Practice (3)
NURS 6230 - Advanced Health Assessment and Diagnostic Reasoning for Advanced Practice (3)
NURS 6430 - Advanced Health Assessment Practicum (1)

Concentration Courses (21 credit hours)

- NUNP 6240 - Advanced Primary Care Reproductive Health (3)
NUNP 6250 - Advanced Primary Care and Health Promotion of Adults Across the Lifespan (3)
NUNP 6260 - Advanced Primary Care of Children and Adolescents (3)
NUNP 6400 - Advanced Primary Care Across the Lifespan Practicum III (4)
NUNP 6440 - Advanced Primary Care Across the Lifespan Practicum II (4)
NUNP 6450 - Advanced Primary Care Across the Lifespan Practicum I (2)
NURS 6210 - Family Health In Advanced Practice Nursing (2)

**Clinical Courses require 60 contact hours of clinical practice for each 1 credit hour. Clinical courses may require travel to clinical sites outside Charlotte and Mecklenburg County.*

Capstone Course (3 credit hours)

- NURS 6603 - Synthesis in Advanced Nursing Practice (1)

Additional Requirements

- A minimum of 600 hours of supervised clinical experience as a Nurse Practitioner
- Students will be referred to the Graduate School for suspension for a grade of C or below in any NUNP course. Graduate students must maintain a 3.0 GPA in order to progress and graduate.
- Coursework must be completed within six years.
- Faculty advising

Degree Total = 46 Credit Hours

Post-Master's Certificate in Family Nurse Practitioner Across the Lifespan

The certificate consists of concentration courses in advanced Family Nurse Practitioner nursing (minimum 21 credit hours). This certificate program prepares nurses holding Master's degrees in nursing to enter advanced practice nursing in primary care as a Family Nurse Practitioner. Nurses with advanced nursing degrees who are not nurse practitioners will be required to take additional coursework related to health assessment, pharmacology, and pathophysiology. Nurses already certified and practicing as Nurse Practitioners will have their transcripts reviewed. The recipients of this certificate are eligible to take the American Nurses Credentialing Center (ANCC) or the American Academy of Nurse Practitioner (AANP) examination for Family Nurse Practitioner Across the Lifespan certification. The Post-Master's Certificate in Family Nurse Practitioner program is a full-time, campus-based hybrid program.

Admission Requirements

- 1) A MSN from a college or university accredited by an accepted accrediting body
- 2) Unencumbered North Carolina license or compact state license as a Registered Nurse
- 3) Overall GPA of 3.0 on a 4.0 scale in the MSN degree
- 4) Statement of Purpose explaining the applicant's career goal and preparation in relation to primary care and family practice. Identify qualities that make them a strong applicant (See the School of Nursing website for required elements of the Purpose Statement). *The Statement of Purpose should not exceed two double-spaced typed pages.*
- 5) Three references should be from professional colleagues and should speak to clinical knowledge and expertise and one's ability to function as a member of the healthcare team. At least one reference must be from a supervisor.
- 6) Applicants who meet admission requirements may be invited for an interview with the admissions committee.
- 7) Graduate Health Assessment Pharmacology and Pathophysiology coursework will be evaluated for each candidate.

Application is competitive. Students are admitted annually in the Fall semester. See the School of Nursing website at nursing.charlotte.edu for application deadline.

Certificate Requirements

NUNP 6240 - Advanced Primary Care Reproductive Healthcare (3)

NUNP 6250 - Advanced Primary Care and Health

Promotion of Adults Across the Lifespan (3)

NUNP 6260 - Advanced Primary Care of Children and Adolescents (3)

NUNP 6400 - Advanced Primary Care Across the Lifespan Practicum III (4)

NUNP 6440 - Advanced Primary Care Across the Lifespan Practicum II (4)

NUNP 6450 - Advanced Primary Care Across the Lifespan Practicum I (2)

NURS 6210 - Family Health in Advanced Practice Nursing (2)

**Clinical Courses require 60 contact hours of clinical practice for each 1 credit hour. Clinical courses may require travel to clinical sites outside Charlotte and Mecklenburg County.*

Certificate Total = Minimum 21 Credit Hours

Additional Requirements

- A minimum of 600 hours of supervised clinical experience as a Nurse Practitioner
- Students will be referred to the Graduate School for suspension for a grade of C or below in any NUNP course. Graduate students must maintain a 3.0 in order to progress and graduate.
- Coursework must be completed within six years.
- Faculty advising is required.

Systems/Populations Specialties

Graduate Certificate in Applied Nursing Informatics

*****This is a Distance Education program.*****

The Graduate Certificate in Applied Nursing Informatics is designed for nurses who hold a BSN or graduate nursing degree and desire to enhance their skills in clinical application of nursing informatics. The course content is focused on implementing, managing, or conducting analytics using clinical/administrative information systems. The certificate program consists of four courses (12 credit hours) that can be taken over a calendar year. The courses toward the certificate can be taken concurrently with Nurse Administration and other M.S.N. curriculum. The certificate program is offered online.

Admission Requirements

- B.S.N. or M.S.N. with a minimum GPA of 2.8 from a college or university accredited by an accepted accrediting body
- Current unrestricted Registered Nurse license in NC or compact state
- Statement of Purpose that includes a description of the applicant's interest in nursing informatics and career plans using the certification; the statement is not exceed one page in length
- Three letters of professional recommendation

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Certificate Requirements

Required Courses (12 credit hours)

HCIP 6102 - Healthcare Data Analysis (3)

HCIP 6380 - Introduction to Health Informatics (3)

NURS 6187 - Financial, Human, and Information Technology Resource Management in Complex Systems (3)

NURS 6188 - Application of Nursing Informatics in Strategic Planning and Decision-Making (3)

Other Requirements

- Completion of 12 credit hours of required coursework within five years
- This is an online program; access to a computer and reliable internet is required

Certificate Total = 12 Credit Hours

Grade Requirements

Students must maintain a minimum 3.0 GPA in their graduate courses and may not accumulate more than two C grades.

Master of Science in Nursing (MSN) – Nurse Administration

*****This is a Distance Education program.*****

This concentration prepares nurses for advanced practice in administrative roles such as Nurse Executive, Nurse Manager, Quality Improvement Manager, Ambulatory Care Manager or other system level nursing positions in community agencies, healthcare facilities, health departments and schools of nursing.

Admission Requirements

- 1) Current unrestricted licensure as a Registered Nurse; current license in North Carolina or a compact state or the state identified by faculty for clinical practice before enrollment
- 2) Baccalaureate degree from a college or university accredited by an accepted accrediting body. If the degree is not in Nursing and courses in Research, Leadership/Management, Aging and Health and Community Health are lacking, they will be required as part of the program of study (option available only to Nurse Administration, Community/Public Health Nursing, and Nurse Educator concentrations).
- 3) One year of professional nursing practice is recommended
- 4) An essay (statement of purpose) describing the applicant's experience and objective in undertaking graduate study in the chosen concentration, including the qualities making them a strong applicant (See the School of Nursing website for required elements of the Purpose Statement)
- 5) Overall GPA of at least 3.0 in the last degree earned
- 6) Completion of a statistics course with a grade of C or above
- 7) See School of Nursing website for admission deadlines

Degree Requirements

Core Courses (9 credit hours)

NURS 6101 - Theoretical Basis for Nursing Practice (3)

NURS 6160 - Research in Nursing and Health Professions (3)

NURS 6115 - Health Policy and Planning in the U.S. (3)

System Core Courses (6 credit hours)

NURS 6211 - Health Issues in Nursing (3)

or NURS 6090 - Selected Topics (Study Abroad) (3)

NURS 6212 - Program Improvement and Evaluation (3)

Concentration Courses (18 credit hours)

NURS 6185 - Theory and Application in the Organizational Behavior to Nursing Systems (3)

NURS 6187 - Financial, Human, and Information Technology Resource Management in Complex Systems (3)

NURS 6188 - Application of Nursing Informatics in Strategic Planning and Decision-Making (3)

NURS 6282 - Interprofessional Collaboration in Healthcare (3)

NURS 6302 - Trends and Issues in Nursing Education (3) or NURS 6303 - Instructional Technology in Nursing Education (3)

NURS 6485 - Advanced Practicum in Nursing Administration and Leadership (3)

Capstone Course (3 credit hours)

NURS 6603 - Synthesis in Advanced Nursing Practice (3)

Additional Requirements

- 1) Nursing Administration concentration courses are only offered online through Distance Education; Core and System/Population Core courses can be taken on campus or online as published in the Schedule of Courses
- 2) Some courses in the Nursing Administration concentration are offered every other year
- 3) A total of 180 clinical hours is required to complete the program
- 4) Faculty Advising is required
- 5) Access to computer within minimum requirements for online courses; current minimum computer hardware specifications are listed by Distance Education online at distanceed.charlotte.edu

Degree Total = 36 Credit Hours

Grade Requirements

Students must maintain a minimum 3.0 GPA in their graduate courses, and may not accumulate more than two C grades.

Graduate Certificate in Nurse Administration

*****This is a Distance Education program.*****

The Certificate in Nursing Administration is designed for nurses who hold a bachelor's degree and desire to enhance their administrative skills and advanced practice nurses with master's degree who desire additional

knowledge to be competitive in managing personnel or groups.

The Nursing Administration certificate program of study consists of concentration courses in nursing administration (12 graduate credit hours). Students complete four specialty courses. The certificate can be completed in one year through part-time study.

Admission Requirements

- 1) Baccalaureate degree from a college or university accredited by an accepted accrediting body
- 2) Graduation from a post-secondary level Nursing Program (United States RN Registration not required)
- 3) An essay (statement of purpose) in application packet that includes a description of a selected area of specialization in nursing practice
- 4) Three letters of professional recommendation
- 5) GRE or MAT is not required for certificate program

Certificate Requirements

Required Courses (12 credit hours)

NURS 6185 - Theory and Application in the Organizational Behavior to Nursing Systems (3)

NURS 6187 - Financial, Human, and Information Technology Resource Management in Complex Systems (3)

NURS 6188 - Application of Nursing Informatics in Strategic Planning and Decision-Making (3)

NURS 6212 - Program Improvement and Evaluation (3)

Additional Requirements

- Completion of 12 credit hours of required coursework within five years
- Access to a computer with minimum requirements for online courses; current minimum computer hardware specifications are listed by Distance Education online at distanceed.charlotte.edu

Certificate Total = 12 Credit Hours

Grade Requirements

Students must maintain a minimum 3.0 GPA in their graduate courses and may not accumulate more than two C grades.

Master of Science in Nursing (MSN) – Nurse Educator

*****This is a Distance Education program.*****

This concentration focuses on preparing nurses for advanced roles as a Nurse Educator. Graduates are

prepared for positions teaching nursing in college, university, and clinical settings. Two clinical practicum courses totaling 360 supervised hours are required.

Admission Requirements

- 1) Current unrestricted licensure as a Registered Nurse in North Carolina or a compact state or the state identified by faculty for clinical practice before enrollment
- 2) Baccalaureate degree from a college or university accredited by an accepted accrediting body; if the degree is not in Nursing and courses in Research, Leadership/Management, Aging and Health and Community Health are lacking, they will be required as part of the program of study (option available only to Nurse Administration, Community/Public Health Nursing, and Nurse Educator concentrations)
- 3) One year of professional nursing practice is recommended
- 4) An essay (statement of purpose) describing the applicant's experience and objective in undertaking graduate study in the chosen concentration, including the qualities making them a strong applicant (See the School of Nursing website for required elements of the Purpose Statement).
- 5) Overall GPA of at least 3.0 in the last degree earned
- 6) Completion of a statistics course with a grade of C or above
- 7) See School of Nursing website for admission deadlines

Degree Requirements

This program requires completion of 39 credit hours in approved courses, including two clinical practicum and a synthesis course.

Core Courses (12 credit hours)

NURS 6101 - Theoretical Basis for Nursing Practice (3)
 NURS 6160 - Research in Nursing and Health Professions (3)
 NURS 6115 - Health Policy and Planning in the U.S. (3)
 STAT 6127 - Introduction to Biostatistics (3)

Concentration Courses (24 credit hours)

NURS 6212 - Program Improvement and Evaluation (3)
 NURS 6301 - Curriculum and Instruction in Nursing Education (3)
 NURS 6302 - Trends and Issues in Nursing Education (3)
 NURS 6303 - Instructional Technology in Nursing Education (3)
 NURS 6305 - Advanced Pathology and Pharmacology for Nurse Educators (3)
 NURS 6304 - Teaching Practicum in Nursing Education (3)
 NURS 6306 - Health Assessment for Nurse Educators (3)
 NURS 6495 - Nurse Educator Advanced Clinical Practicum (3)

Capstone Course (3 credit hours)

NURS 6603 Synthesis in Advanced Nursing Practice (3)

Additional Requirements

- A total of 180 hours in a clinical specialty and 180 hours of supervised teaching experience is required. The clinical site and preceptors are individually arranged by students and course faculty. CAUTION: Not all states allow out-of-state programs to oversee clinical rotations in their state. Check with faculty advisors before taking travel assignments or relocating to other states.
- Faculty Advising is required.
- This is a Distance Education program, dependable access to computer and the internet are required. Current minimum computer hardware specifications are listed online by Distance Education at distanceed.charlotte.edu.

Degree Total = 39 Credit Hours

Graduate Certificate – Nurse Educator

*****This is a Distance Education program.*****

The Graduate Certificate in Nursing Education is designed to prepare nurses who have a BSN or MSN to become educational leaders in academic and clinical settings. This certificate consists of four courses, for a total of 12 credit hours and can be completed within one calendar year. The Graduate Certificate provides students with the coursework needed to enhance the student's professional teaching skills.

Admission Requirements

- 1) BSN or Master of Science in Nursing (MSN) degree from a college or university accredited by an accepted accrediting body
- 2) Current unrestricted licensure as a Registered Nurse
- 3) An essay (statement of purpose) in application packet that includes a description of a selected area of specialization in nursing practice. It is expected that the student will develop a portfolio demonstrating expertise in a specialization during this program of study.
- 4) Three letters of professional recommendation
- 5) GRE or MAT is not required for certificate program

Certificate Requirements

Required Courses (12 credit hours)

NURS 6301 - Curriculum and Instruction in Nursing Education -

NURS 6302 - Trends and Issues in Nursing Education
 NURS 6303 - Instructional Technology in Nursing Education
 NURS 6304 - Teaching Practicum in Nursing Education

Additional Requirements

- 1) A total of 180 hours of supervised teaching experience, individually arranged, is required
- 2) Access to computer within minimum requirements for online courses. Current minimum computer hardware specifications are listed by Distance Education online at distanceed.charlotte.edu.

Certificate Total = 12 Credit Hours

Master of Science in Nursing (MSN) – Community/Public Health Nursing

*****This is a Distance Education program.*****

The Community/Public Health Nursing concentration prepares nurses to assume leadership in assessing communities and populations, identifying high risk groups, and in partnership with communities, consumers, and stakeholders, developing culturally sensitive, acceptable and realistic community-based nursing services.

Admission Requirements

- 1) Current unrestricted licensure as a Registered Nurse; current license in North Carolina or a compact state or the state identified by faculty for clinical practice before enrollment
- 2) Baccalaureate degree in Nursing from a college or university accredited by an accepted accrediting body. If the degree is not in Nursing and courses in Research, Leadership/Management, Aging and Health and Community Health are lacking, additional coursework in these areas will be required as part of the program of study (option available only to Nurse Administration, Community/Public Health Nursing, and Nurse Educator concentrations)
- 3) One year of professional nursing practice is recommended
- 4) An essay (statement of purpose) describing the applicant's experience and objective in undertaking graduate study in the chosen concentration, including the qualities making them a strong applicant (See the School of Nursing website for required elements of the Purpose Statement)
- 5) Overall GPA of at least 3.0 in the last degree earned
- 6) Completion of a statistics course with a grade of C or above

- 7) See School of Nursing website for admission deadlines

Degree Requirements

Core Courses (9 credit hours)

NURS 6101 - Theoretical Basis for Nursing Practice (3)
 NURS 6160 - Research in Nursing and Health Professions (3)
 NURS 6115 - Health Policy and Planning in the U.S. (3)

Cognate Courses (6 credit hours)

NURS 6202 - Applied Epidemiology in Advanced Nursing (3)
 STAT 6127 - Introduction to Biostatistics (3)

Elective Course (3 credit hours)

Select one of the following:

NURS 6185 - Theory and Application in the Organizational Behavior to Nursing Systems (3)
 NURS 6187 - Financial, Human, and Information Technology Resource Management in Complex Systems (3)
 NURS 6188 - Application of Nursing Informatics in Strategic Planning and Decision-Making (3)
 NURS 6275 - Health Promotion, Nutrition, and Wellness for Older Adults (3)
 NURS 6282 - Interprofessional Collaboration in Healthcare (3)
 NURS 6301 - Curriculum and Instruction in Nursing Education (3)
 NURS 6302 - Trends and Issues in Nursing Education (3)
 NURS 6303 - Instructional Technology in Nursing Education (3)
 EIST 5100 - Technology Integration in Education (3)
 EIST 6000 - Topics in Instructional Systems Technology (16)
 EIST 6100 - Foundations of Instructional Systems Technology (3)
 EIST 6101 - Learning Principles in Instructional Systems Technology (3)
 EIST 6110 - Instructional Design (3)
 EIST 6135 - Learning Media, Resources, and Technology (3)

System Core Courses (6 credit hours)

NURS 6211 - Health Issues in Nursing (3)
 or NURS 6090 - Selected Topics (*Study Abroad*)
 NURS 6212 - Program Improvement and Evaluation (3)

Concentration Courses (11 credit hours)

NURS 6180 - Community/Public Health Nursing (3)
 NURS 6480 - Internship I (3)
 NURS 6481 - Internship II (3)
 NURS 6210 - Family Health in Advanced Practice Nursing (2)

Capstone Course (3 credit hours)

NURS 6603 - Synthesis in Advanced Nursing Practice (3)

Additional Requirements

This concentration also requires the completion of 360 hours of supervised clinical practicum.

Degree Total = 38 Credit Hours

Grade Requirements

Students must maintain a GPA of 3.0 or above.

SOCIAL WORK

- Master of Social Work (MSW)
- Graduate Certificate in Early Childhood Mental Health (*see the College of Education section*)

Department of Social Work

socialwork.charlotte.edu

Master of Social Work (MSW)

UNC Charlotte's nationally-ranked Master of Social Work program prepares students to be social work professionals and leaders in areas of culturally-informed, community-engaged practice, policy, and research. MSW students receive an advanced generalist social work education, and specialize their study through electives and practicum. The MSW program emphasizes social justice through the curriculum, and intervening at all levels of society. The location in Charlotte offers both urban and rural opportunities for learning.

Admission Requirements

The following are given consideration in the admission process:

- 1) Undergraduate Preparation, including GPA
 - The Graduate School sets a 3.0 as the minimum GPA for admission to master's programs
 - The Graduate School requires students to provide copies of unofficial transcripts for all institutions the applicant has attended
 - The School of Social Work seeks applicants with a liberal arts background. Previous courses in biology and statistics are encouraged, but not required.
- 2) Professional Recommendations
- 3) Relevant Volunteer and/or Paid Experience
- 4) Personal Statement - See the MSW program website for details

International applicants may be required by The Graduate School to submit additional materials.

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Upon acceptance to the program, students are asked to complete an Intent to Enroll Form.

Degree Requirements

The MSW Program educates students to become

competent social work professionals in practice, research, service, and advocacy areas who are prepared to:

1. Promote human and community well-being by advocating for and promoting expansion of diversity, inclusion, access, and equity.
2. Challenge social, racial, economic, and environmental injustice to reduce poverty and facilitate realization of expanded human rights.
3. Pursue positive social change to enhance quality of life for all through:
 - A strengths-based, person in environment construct that values the dignity and worth of every person;
 - A local, regional, state, and/or global perspective;
 - Knowledge based on a scientific inquiry-driven curriculum.
4. Engage, assess, evaluate, and coordinate on all levels (micro, mezzo, macro) with individuals, families, groups, communities, and organizations.
5. Uphold the core social work values of service, social justice, the dignity and worth of every person, the importance of human relationships, integrity, competence, human rights, and scientific inquiry, and practice through use of an anti-racist and anti-oppressive perspective.

MSW Program Options

The MSW program includes Advanced Standing (39 credits) and Traditional (60 credits) options that may each be completed on campus or online. For information on each of the MSW plans of study, see the Social Work Curriculum Program Handbook.

Advanced Standing Degree (39 credits)

The Advanced Standing plan of study is designed for students who have earned a BSW from an accredited social work program within the past seven years and wish to pursue the MSW through an accelerated format. Advanced Standing students are not required to complete the generalist curriculum for the MSW. Students complete 39 graduate credit hours, which includes 33 credit hours in the classroom and 6 credits in an approved field placement. Advanced Standing students pursuing their MSW on-campus complete the program in 1-year, while students pursuing their MSW online complete the program in 2-years.

Curriculum

SOWK 6232 - Practice and Program Evaluation (3)
 SOWK 6242 - Advocacy and Policy Change (3)
 SOWK 6252 - Mental Health Assessment (3)
 SOWK 7122 - Advanced Social Work Practice with Individuals (3)
 SOWK 7126 - Advanced Social Work Practice with

Groups (3)

SOWK 7127 - Advanced Social Work Practice with Families (3)
 SOWK 7222 - Advanced Social Work Practice with Organizations (3)
 SOWK 7223 - Advanced Social Work Practice with Communities (3)
 SOWK 7443 - Advanced Social Work Practicum I (3)
 SOWK 7444 - Advanced Social Work Practicum II (3)
 SOWK 7651 - Reflection and Synthesis (3)

Electives

Two three-credit graduate electives totaling six-credits. Electives may be taken in SOWK or from the following pre-approved disciplines: CHFD, CJUS, CSLG, ELED, GRNT, LTAM, MPAD, SPED, and WGST.

Advanced Standing Degree Total = 39 Credits

Traditional Degree (60 credits)

The Traditional program options include both the generalist and specialized curricula. Students complete a total of 60 graduate credit hours, which includes 48 credit hours in the classroom and 12 credits in an approved field placement. Students pursuing their MSWs on campus complete their degrees in 2-years of study. Students pursuing their MSWs online complete their degrees in 3-years of study.

Generalist Curriculum

SOWK 6121 - Social Work Practice: Theories and Skills (3)
 SOWK 6131 - Social Work Research (3)
 SOWK 6141 - Foundations of Social Work (3)
 SOWK 6151 - Social Work, Social Justice, and Diversity (3)
 SOWK 6441 - Foundation Social Work Practicum I (3)
 SOWK 6442 - Foundation Social Work Practicum II (3)

Specialized Curriculum

SOWK 6232 - Practice and Program Evaluation (3)
 SOWK 6242 - Advocacy and Policy Change (3)
 SOWK 6252 - Mental Health Assessment (3)
 SOWK 7122 - Advanced Social Work Practice with Individuals (3)
 SOWK 7126 - Advanced Social Work Practice with Groups (3)
 SOWK 7127 - Advanced Social Work Practice with Families (3)
 SOWK 7222 - Advanced Social Work Practice with Organizations (3)
 SOWK 7223 - Advanced Social Work Practice with Communities (3)
 SOWK 7443 - Advanced Social Work Practicum I (3)
 SOWK 7444 - Advanced Social Work Practicum II (3)
 SOWK 7651 - Reflection and Synthesis (3)

Electives (9 credits)

Three three-credit graduate electives totaling nine-credits. Electives may be taken in SOWK or from the following pre-approved disciplines: CHFD, CJUS, CSLG, ELED, GRNT, LTAM, MPAD, SPED, and WGST.

Degree Total = 60 Credit Hours

Practicum

Practicum placements are assigned from a variety of agencies and practice settings approved by the UNC Charlotte School of Social Work Office of Practicum Experiences. Practicum Instructors, approved by the School of Social Work, guide the student through learning experiences, coordinating practicum experiences with the concurrent classroom coursework. The generalist placement prepares students to apply foundational social work knowledge, skills, and values. The specialized placement prepares students for advanced application of social work skills, with continued attention to vulnerable populations.

Financial Assistance

Paid internships and assistantships are limited. Visit socialwork.charlotte.edu for more information.

State Certification

Graduates of the MSW Program may pursue state licensure or certification at the graduate level. Application for licensure or certification should be made with the state board in the state where the applicant intends to practice social work. In North Carolina, the Certification and Licensure Board for Social Work may be accessed on the web at ncswboard.org or by phone at 336-625-1679. MSW levels of licensure/certification in North Carolina include the following: Licensed Clinical Social Worker (LCSW), Licensed Clinical Social Worker Associate (LCSWA), Certified Master Social Worker (CMSW), and Certified Social Work Manager (CSWM).

Special Programs

North Carolina Child Welfare Education Collaborative

UNC Charlotte participates in the North Carolina Child Welfare Education Collaborative (CWEC), which is a joint effort of the NC DHHS and the School of Social Work. CWEC's mission is to strengthen the public child welfare workforce in North Carolina, thus, improving outcomes for families and children. At UNC Charlotte, CWEC students take SOWK 5103 (Child Welfare) as one of their electives, and participate in practicum at a child welfare agency. Students who complete all requirements for the CWEC program receive a certificate and medallion indicating they have successfully met North Carolina Child Welfare Training competencies.

For additional information about the North Carolina Child Welfare Education Collaborative at UNC Charlotte, please

visit the North Carolina Child Welfare Education Collaborative website or contact the CWEC Liaison.

School Social Work

Graduates of the program may also qualify for licensure as a School Social Worker in the state of North Carolina. The school social work license is awarded by the North Carolina Department of Public Instruction. To be eligible for school social work licensure, MSW students must complete a two-semester field placement in a school setting, take SOWK 5102 (School Social Work), and one additional pre-approved elective. Students interested in school social work licensure should begin planning at program entry with their advisors and the school social work licensure liaison.

For additional information about school social work licensure, please visit the UNC Charlotte School of Social Work School Social Work Licensure page or contact the licensure Liaison.



College of Humanities & Earth and Social Sciences

chess.charlotte.edu

The College of Humanities & Earth and Social Sciences (CHESS) is the largest of the eight discipline-based colleges at the University of North Carolina at Charlotte, housing 17 academic departments and numerous interdisciplinary programs. The College serves the Charlotte region and the state of North Carolina and is engaged in the discovery, dissemination, synthesis and application of knowledge. It provides for the educational, economic, social, and cultural advancement of the people of North Carolina through on-and off-campus programs, continuing personal and professional education opportunities, research and collaborative relationships with the private, public, and nonprofit institutional resources of the greater Charlotte metropolitan region. The College offers a wide array of graduate programming including graduate certificate, Master of Arts, Master of Science, and Ph.D. programs.

Graduate Degree Programs

- Master of Arts in Anthropology
- Master of Arts in Anthropology and Master of Public Health Dual Degree (*see College of Health and Human Services section*)
- Master of Arts in Communication Studies

- Master of Arts in English
- Master of Arts in Ethics and Applied Philosophy
- Master of Arts in Geography
- Master of Arts in History
- Master of Arts in Latin American Studies
- Master of Arts in Interdisciplinary Studies
- Master of Arts in Psychology
- Master of Arts in Industrial/Organizational Psychology
- Master of Arts in Religious Studies
- Master of Arts in Sociology
- Master of Arts in Spanish
- Master of Public Administration
- Master of Science in Criminal Justice
- Master of Science in Earth Sciences
- Ph.D. in Geography
- Ph.D. in Health Psychology (*with Colleges of Education and Health & Human Services*)
- Ph.D. in Infrastructure and Environmental Systems (*see The William States Lee College of Engineering section*)
- Ph.D. in Organizational Science
- Ph.D. in Public Policy

Graduate Non-Degree Programs

- Graduate Certificate in Applied Ethics
- Graduate Certificate in Applied Linguistics
- Graduate Certificate in Biomedical Sciences
- Graduate Certificate in Biotechnology
- Graduate Certificate in Cognitive Science
- Graduate Certificate in Crime Analysis
- Graduate Certificate in Emergency Management
- Graduate Certificate in Gender, Sexuality, and Women's Studies
- Graduate Certificate in Geographic Information Science and Technology
- Graduate Certificate in Gerontology
- Graduate Certificate in Languages, Cultures and Translation: Business Languages
- Graduate Certificate in Languages, Cultures and Translation: Translating
- Graduate Certificate in Languages, Cultures and Translation: Translation and Interpreting Studies, Spanish-English
- Graduate Certificate in Nonprofit Management
- Graduate Certificate in Public Budgeting and Finance
- Graduate Certificate in Public Policy Research and Analysis
- Graduate Certificate in Technical/Professional Writing
- Graduate Certificate in Urban Management and Policy

ANTHROPOLOGY

- **M.A. in Anthropology**
 - Applied Anthropology
 - Medical Anthropology
 - General Anthropology
- **M.A. in Anthropology/Master of Public Health (MPH) Dual Degree** (*see College of Health and Human Services section*)
- **Architecture (Critical Heritage Studies Concentration), M.S. and Anthropology, M.A., Dual Degree** (*see College of Arts & Architecture section*)

Department of Anthropology

anthropology.charlotte.edu

M.A. in Anthropology

Anthropology is an integrative and comparative field of scholarship devoted to discovering and analyzing the range of human biological and cultural variation, as well as to understanding the historical, ecological, and sociopolitical contexts in which human diversities and commonalities develop. The field encompasses and integrates cultural anthropology (the study of living communities), linguistic anthropology (the study of the human use of language), biological anthropology (the study of humans' primate relatives, human evolution, and modern biological variation), and archaeology (the study of the culture of past communities). The Master of Arts in Anthropology degree program will provide students with the theoretical and methodological skills to gather, record, analyze, and communicate about human activity patterns in the past and present, and at local and global levels.

The M.A. in Anthropology is designed to meet the needs of two kinds of students: those seeking to prepare for doctoral education in anthropology or other fields and those seeking post-baccalaureate skills for employment in a wide range of occupations in our increasingly intercultural and international world: education, government, program planning and evaluation, healthcare, media, the nonprofit sector, and business. Coursework in the program will build skills in data collection, analysis, and interpretation, and the application of anthropological perspectives to both theoretical and applied problems.

The M.A. in Anthropology has the following educational objectives:

- to provide opportunities for post-baccalaureate study about the human species from evolutionary and cross-cultural perspectives;
- to provide training for the application of anthropological techniques and perspectives to contemporary social problems;
- to expand cross-cultural understanding within regional and national communities and institutions;
- to expand understanding of the complex interconnections between local communities and global environments, both natural and social;
- to emphasize the importance of cross-disciplinary, biocultural approaches to research on the human species.

Admission Requirements

In addition to meeting the University's graduate admission requirements, all prospective students must submit:

- A minimum of three letters of reference, of which at least two are from academic sources
- B.A. in Anthropology or a related field, such as Area Studies, History, Biology, Sociology, etc.
- GPA of at least 3.0 in the student's undergraduate degree

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The M.A. in Anthropology requires the completion of a minimum of 33 credit hours of approved graduate work. The successful completion of a Capstone, in the form of a Thesis or a Practicum, is also required.

Core Courses (12 credit hours)

Required Core Course

ANTH 6601 - History of Anthropology (3)

Elective Core Courses

Select two of the following:

ANTH 6603 - Theory in Cultural Anthropology (3)

ANTH 6604 - Archaeological Theory and Practice (3)

ANTH 6605 - Evolutionary and Biological Anthropology (3)

ANTH 6606 - Foundational Issues in Linguistic Anthropology (3)

Select one of the following:

ANTH 5122 - Ethnographic Methods (3)

ANTH 5140 - Field Biology of the Primates

ANTH 5453 - Field Project in Archaeology (1 to 4)

ANTH 5641 - Bioarchaeology Methods (3)

Concentration Courses (21 credit hours)

Select from the Applied Anthropology and Medical Anthropology concentrations or complete the General Anthropology requirements. All students must complete either a thesis or a practicum to meet the capstone requirement for their selected concentration. Students in the General Anthropology concentration complete a research-based thesis. Students in the Applied Anthropology and Medical Anthropology concentrations complete a research-based report as part of a practicum with an organization, institution, or agency. As part of their elective course requirements, students in any concentration may also earn up to 6 credit hours in programs outside of the Department of Anthropology, with approval of the Graduate Program Director.

Applied Anthropology Concentration

Required Courses

ANTH 6611 - Seminar in Applied Anthropology (3)

ANTH 6400 - Anthropology Practicum (3)

Elective Courses

Select five courses from the following:

ANTH 5XXX - Anthropology Elective (3)

ANTH 6XXX - Anthropology Elective (3)

Medical Anthropology Concentration

Required Courses

ANTH 6611 - Seminar in Applied Anthropology (3)

ANTH 6613 - Seminar in Medical Anthropology (3)

ANTH 6400 - Anthropology Practicum (3)

Elective Courses

Select four courses from the following:

ANTH 5XXX - Anthropology Elective (3)

ANTH 6XXX - Anthropology Elective (3)

General Anthropology Concentration

Required Courses

ANTH 6910 - Thesis Tutorial (3)

ANTH 6920 - Master's Thesis (3)

Elective Courses

Select five courses from the following:

ANTH 5XXX - Anthropology Elective (3)

ANTH 6XXX - Anthropology Elective (3)

Degree Total = 33 Credit Hours

Grade Requirements

Students must complete all required coursework with a GPA of 3.0 or above.

Advising

The Graduate Program Director appoints an advisor for each graduate student from among the Anthropology Graduate Faculty.

Committees

Each student forms a committee of three faculty with the advice of the Graduate Program Director. One of these committee members may come from another department.

Foreign Language Requirement

There is no specific language requirement, but students in the General Anthropology concentration are encouraged to pursue appropriate language study.

Application to Graduation

Students must complete an Application for Graduation by the deadline date specified in the official University academic calendar in the semester in which they plan to graduate. Details are available on the Graduate School website at graduateschool.charlotte.edu/current-students/graduation-clearance.

Assistantships

The Department offers a limited number of graduate assistantships. Awards are made on a competitive basis after acceptance to the program. Interested students should complete the Graduate Assistantship Application online at graduateschool.charlotte.edu.

M.A. in Anthropology / Master of Public Health (MPH) Dual Degree

This dual degree program allows students to earn both a Master of Arts in Anthropology degree from the College of Humanities & Earth and Social Sciences and a Master of Public Health (MPH) degree from the College of Health and Human Services. Students are expected to meet the admission requirements of both programs to participate in the dual degree program. For details, see the College of Health and Human Services section of this *Catalog*.

COGNITIVE SCIENCE

- Graduate Certificate in Cognitive Science

Graduate Program

cognisci.charlotte.edu

Graduate Certificate in Cognitive Science

The Graduate Certificate in Cognitive Science offers graduate students an opportunity for an interdisciplinary program of study. Training focuses on an understanding of human cognitive processes and the means by which complex mental processes can be modeled or simulated by artificial systems. Cognitive science is a dynamic and rapidly evolving field that studies intelligent systems by synthesizing the knowledge and methodology from the fields of cognitive psychology, artificial intelligence, linguistics, philosophy of mind and cognitive neuroscience. Students are provided with the conceptual framework and the technical skills necessary to enhance careers in research, teaching, business or government. Students completing the program add an interdisciplinary perspective to the training received in their major, better preparing them for employment or further study in a variety of sciences and social sciences. The certificate may be pursued as a stand-alone program or concurrently with another graduate degree program at UNC Charlotte.

Admission Requirements

The certificate program is open to all students who hold a bachelor's degree from a college or university accredited by an accepted accrediting body and either:

- are enrolled and in good standing in a graduate degree program at UNC Charlotte, or
- have a minimum GPA of 3.0 for their undergraduate courses.

Application for the Cognitive Science Certificate Program is made through the Office of Graduate Admissions.

Certificate Requirements

The Graduate Certificate in Cognitive Science Program involves 15 credit hours of coursework. Students must take the required introductory course and at least two of the disciplinary courses. The remaining hours may come from any of the other topics courses listed.

Required Course

Select one of the following:

PSYC 6216 - Introduction to Cognitive Science (3)

ITCS 6216 - Introduction to Cognitive Science (3)
 ITIS 6216 - Introduction to Cognitive Science (3)

Disciplinary Courses

Select at least two of the following:

PSYC 6116 - Cognition (3)
 ENGL 6163 - Understanding Language Learning: Mind, Identity, and the Sociocultural World (3)
 ITCS 6150 - Intelligent Systems (3)
 PHIL 6340 - Philosophy of Mind (3)

Elective Courses

PSYC 5316 - Cognitive Neuroscience (3)
 PSYC 6015 - Topics in Perception and Physiological Psychology (3)
 PSYC 6102 - Organizational Research Methods (3)
 PSYC 6115 - Sensation and Perception (3)
 ITCS 5152 - Computer Vision (3)
 ITCS 6151 - Intelligent Robotics (3)
 ITCS 6153 - Neural Networks (3)
 ITCS 6156 - Machine Learning (3)
 ITCS 6158 - Natural Language Processing (3)
 ITIS 6400 - Principles of Human Computer Interaction (3)
 or ITIS 8400 - Principles of Human Computer Interaction (3)
 ITCS 6500 - Complex Adaptive Systems (3)
 or ITCS 8500 - Complex Adaptive Systems (3)
 or ITIS 6500 - Complex Adaptive Systems (3)
 or ITIS 8500 - Complex Adaptive Systems (3)
 ECGR 5196 - Introduction to Robotics (3)
 ECGR 6102 - Optimization of Engineering Designs (3)
 ECGR 6266 - Neural Networks Theory and Design (3)
 ECGR 8266 - Neural Networks Theory and Design (3)
 CEGR 5181 - Human Factors in Traffic Engineering (3)
 Topics, seminars, or other courses in the cognitive sciences approved by the Graduate Program Director

Certificate Total = 15 Credit Hours

Grade Requirements

A cumulative GPA of 3.0 is required and at most one course with a grade of C may be allowed toward the certificate.

COMMUNICATION STUDIES

• M.A. in Communication Studies

Department of Communication Studies
 gradcomm.charlotte.edu

M.A. in Communication Studies

The Master of Arts in Communication Studies is designed to provide advanced study in the communication discipline, particularly in the areas of organizational communication, critical media and rhetorical studies, health communication, and public relations. All studies emphasize the ability to understand and analyze communication practices in different environments in the 21st Century. The curriculum is broad-based and is a balance of theory and application to practice.

Admission Requirements

At minimum, students must:

- Meet all of the Graduate School requirements
- Submit three letters of recommendation
- Submit a strong personal essay outlining their reasons for pursuing a master's degree
- Submit an academic writing sample

The department does allow students to take up to six (6) credit hours as a post-baccalaureate student; students must follow the Graduate School guidelines for application for this status. Students are encouraged to meet with the Graduate Program Director as soon as possible after registering as a post-baccalaureate student to discuss application procedures and program options.

GRE Waiver

The GRE score requirement is waived for all applicants to the M.A. in Communication Studies program.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Master of Arts degree program requires the

completion of thirty-three (33) credit hours of graduate work. All students, regardless of orientation and area of study, must complete four (4) core courses. All students writing a thesis or a directed project earn their final six (6) credit hours with research-based activities. No more than six (6) credit hours may be taken at 5000 level. All courses must be taken within seven years after admission into the Communication Studies master's program.

Core Courses (12 credit hours)

COMM 6011 - Topics in Communication Research Methods (3)
 COMM 6100 - Communication Research Methods (3)
 COMM 6101 - Contemporary Viewpoints in Communication Theory (3)
 COMM 6102 - Professional Seminar in Communication Studies (3)

Interest Area Electives (15-21 credit hours)

The graduate program is a generalist program, in that students don't specialize in any one area but instead take courses across interest areas in COMM 6000 (Topics in Communication Studies) courses.

All graduate assistants must take COMM 6200 (Communication Pedagogy) as one of their electives.

Students may satisfy three hours of elective credit by taking COMM 6880 (Independent Study) or COMM 6881 (Communication Research Practicum) or COMM 6410 (Professional Communication Studies Internship).

Faculty teach and conduct research across the following interest areas:

COMM 6000 - Topics in Communication Studies (3)
 COMM 6200 - Communication Pedagogy (3)
 COMM 6410 - Professional Communication Studies Internship (3 or 6)
 COMM 6880 - Independent Study (3)
 COMM 6881 - Communication Research Practicum (3)

Organizational Communication

Organizational communication focuses on the various ways individuals influence and are influenced by organizations and their members. Work in organizational communication is concerned with organizational culture and symbolism, interpersonal and group communication, change communication, globalization, mediated communication, leader communication, structural concerns of organizational communication, and critical analysis of organizational communication.

Rhetoric, Culture, and Social Change

Graduate study in the rhetoric, culture, and social area focuses on how texts shape experience, thought, and social relations in cultural contexts. Our faculty take up

issues of historical and contemporary concern typically associated with rhetorical and critical-cultural studies, including influence, power, identity, and social change. Example topics in the rhetorical/cultural studies area include African American oratory, rhetorical criticism, sports communication, and rhetoric of social change.

Health Communication

Health communication is a field of study offering students a better understanding of the communication within a health context. This includes, but is not limited to, provider-patient interaction; the creation, promotion, and influence of health information; social and community health issues; healthcare organizations; media messages about health; and interpersonal health communication.

Public Relations

The focus of public relations is on building and maintaining internal and external relationships with entities essential to an organization's success, including the media, activist groups, community groups, and regulators. The focus of UNC Charlotte's program is on public relations management, especially in the areas of issues tracking, corporate communication, crisis communication, not-for-profit communication, and international public relations efforts.

Media and Technology Studies

Graduate study of media and technology studies concentrates on applied and critical research on the organization and effects of media industries and new media technologies. Areas of study include persuasion and popular culture, computer-mediated persuasion, computer-mediated communication, and the rhetoric of spectator sport.

Capstone Experience (0-6 credit hours)

Students choose among three (3) options for their capstone experience: writing a thesis (6 credit hours); designing and conducting a directed project (6 credit hours); or taking the comprehensive examination (0 credit hours).

Thesis

A thesis is a written research document incorporating original research in a student's area of interest. Students select a thesis committee chair and two committee members and submit a proposal to them. The written thesis is defended before the thesis chair and committee members in the semester the student graduates. A thesis must be written and defended within seven (7) calendar years after admission into the Communication Studies master's program.

Directed Project

A directed project is an applied research document involving research and application to a real world problem

or opportunity. Students select a directed project chair and two committee members and submit a project to them. The completed project is presented to the directed project chair and committee members in the semester the student graduates. A directed project must be successfully completed and presented within seven (7) calendar years after admission into the Communication Studies master's program.

Comprehensive Examination

The comprehensive examination is a written examination and oral defense covering communication theory and communication research methods. Students opting to take the comprehensive examination should indicate their intention to the Graduate Program Director in the semester previous to the one in which they plan to sit for the examination. The examination itself carries no credit hours; students selecting this option must take six (6) additional credit hours to reach the thirty-three (33) credit hour requirement. The comprehensive examination must be successfully completed within the seven (7) year master's time limit for degree completion.

Degree Total = 33 Credit Hours

Grade Requirements

Successful completion of the degree requires a minimum GPA of 3.0.

Advising

Upon formal acceptance, all graduate students must meet with the Graduate Program Director to become familiar with the department's expectations. As students progress through their program of study, the Graduate Program Director will assist them in selecting a suitable advisor and committee members for the thesis, directed project, or comprehensive examination options.

Application for Degree

Each student should apply for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Assistantships

The Department has regular teaching assistantships available on a competitive basis to qualified students. Students will automatically be considered for an assistantship as part of the regular application process.

CRIMINAL JUSTICE

- **M.S. in Criminal Justice**
- **Graduate Certificate in Crime Analysis**

Department of Criminal Justice and Criminology

criminaljustice.charlotte.edu

M.S. in Criminal Justice

The Master of Science (M.S.) in Criminal Justice degree program is designed to promote broad based study of the phenomenon of crime and to enhance career opportunities in the field of criminal justice. The program utilizes the social and behavioral sciences in an interdisciplinary approach to study law, crime, and social deviance, and to critically examine the systems created in response to deviance and crime. The objectives of the program are to: (1) provide present and future criminal justice personnel with the educational background necessary to function effectively in the dynamic field of criminal justice; (2) familiarize students with the nature, methods, and functions of research, and with the existing body of knowledge on criminal justice; (3) provide the criminal justice system with qualified candidates for careers in the field; and (4) prepare students for entrance into doctoral programs. Career opportunities available in the criminal justice system include law enforcement, corrections, administration, planning and analysis, juvenile justice, and college instruction. There are also private sector careers available, including private security and loss prevention. Students may enroll in the program on either a full-time or part-time basis. Courses are offered both during the day and in the evening.

Admission Requirements

Admission to the Criminal Justice graduate program is open to students with bachelor's degrees in any discipline who meet the general requirements for admission to the Graduate School. Preference is given to applicants who have a grade point average of at least 3.0, a personal statement describing their interest in attaining the degree, and three strong recommendation letters from those who are able to attest to their academic ability.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

A minimum of 31 credit hours is required.

Core Courses (16 credit hours)

Students must complete each of the following six core courses with a grade of B or above:

CJUS 6101 - The Nature and Theory of Crime (3)
 CJUS 6102 - Research in Criminal Justice I (3)
 CJUS 6103 - Quantitative Crime Analytics I (3)
 CJUS 6104 - Criminal Justice and Social Control (3)
 CJUS 6105 - Criminal Justice Seminar (1)
 CJUS 6106 - Quantitative Crime Analytics II (3)

Elective Courses (15 credit hours)

The elective credit hours may come from any 5000- or 6000-level course offered within the Department of Criminal Justice and Criminology. A maximum of 9 elective credit hours may be taken outside the Department of Criminal Justice and Criminology (with approval of the Graduate Program Director).

CJUS 5XXX-6XXX - Criminal Justice and Criminology Elective (3)
 CJUS 5XXX-6XXX - Criminal Justice and Criminology Elective (3)
 CJUS 5XXX-6XXX - Criminal Justice and Criminology Elective (3)
 CJUS 5XXX-6XXX - Criminal Justice and Criminology Elective (3)
 CJUS 5XXX-6XXX - Criminal Justice and Criminology Elective (3)

Thesis

Students who choose to write a thesis are required to complete 3 credit hours each of the following courses. These credit hours become part of the 15 elective credit hours students must complete.

CJUS 6901 - Thesis I (3)
 CJUS 6902 - Thesis II (1 to 3)

Transfer Courses

A maximum of nine total credit hours with grades of B or above may be transferred from another institution (only six credit hours of core classwork can be transferred). Transfer courses must be consistent with the program and will be accepted at the discretion of the department. At least 22 credit hours must be taken in residence. To complete the program, students have the option of taking a comprehensive examination or writing a thesis.

Degree Total = 31 Credit Hours

Assistantships

The Department of Criminal Justice and Criminology offers graduate assistantships which are awarded primarily on the basis of academic merit.

Financial Aid

In addition to the graduate assistantships, the department offers, as available, research assistantships and grant-funded opportunities for students. In addition, a few scholarships are available each year.

Comprehensive Examination

The comprehensive examination is offered each Fall and Spring semester. The comprehensive examination may be taken no more than two times. Students who fail to pass the comprehensive examination on their second attempt will be terminated from the program.

Graduate Certificate in Crime Analysis

The graduate certificate in Crime Analysis provides students with exposure to practical skills and theoretical insight into understanding crime patterns. The certificate also provides exposure to the ethical issues surrounding data management and analysis. The certificate includes courses aimed at providing students with a marketable skill set.

Admission Requirements

- A bachelor's degree from a college or university accredited by an accepted accrediting body
- Application to the Graduate Admissions portal accompanied by the application fee in effect
- A GPA of at least 2.75
- Unofficial transcripts
- Statement of purpose

Certificate Requirements

The certificate is awarded upon successful completion of 12 credit hours earned in courses. Students may apply credit hours earned in this certificate program toward the M.S. in Criminal Justice program. Requests for related courses and substitutions may be approved at the discretion of the Graduate Program Director. Up to 6 hours of post-baccalaureate status may be applied to the certificate with the approval of the Graduate Program Director. All coursework applied to a certificate must be completed within 5 years.

Required Courses (6 credit hours)

CJUS 6102 - Research Methods and Design (3)
 CJUS 6103 - Quantitative Crime Analytics I (3)

CJUS 6104 - Legal and Ethical Issues in Crime Analysis (3)

Elective Courses (6 credit hours)

Select two of the following:

CJUS 6106 -Quantitative Crime Analytics II (3)

CJUS 6171 - Geospatial Analytics and Crime (3)

CJUS 6172 - Intelligence Analysis (3)

CJUS 6174 - Data Visualization (3)

Certificate Total = 12 Credit Hours

Grade Requirements

Students must earn a B or above in all courses toward the certificate.

EARTH, ENVIRONMENTAL & GEOGRAPHICAL SCIENCES

- **Ph.D. in Geography**
 - Earth and Environmental Systems
 - Geographic Information Science
 - Urban and Regional Analysis
- **Ph.D. in Infrastructure and Environmental Systems** *(see The William States Lee College of Engineering section)*
- **M.A. in Geography**
 - Business Location and Transportation Analytics
 - Geographic Information Science and Technology (GIS&T)
 - Human and Environmental Systems
 - Urban and Regional Analysis
 - Urban Planning
- **M.S. in Earth Sciences**
- **Graduate Certificate in Geographic Information Science and Technology**

Department of Earth, Environmental, and
Geographical Sciences

geoearth.charlotte.edu

Ph.D. in Geography

Students in the Ph.D. in Geography program at UNC Charlotte graduate at the cutting edge of geographic knowledge, instruction, and practice, both within and beyond the academy. Building on the expertise and research strengths of the graduate faculty in Geography and Earth Sciences, there are three areas of focus within the doctoral Geography program.

- 1) Urban and Regional Analysis
- 2) Earth and Environmental Systems
- 3) Geographic Information Science

These concentrations serve as frameworks upon which to build a specialized degree but are complementary and can

be integrated to suit individual student interests and supervising faculty expertise. All three concentrations share a common set of required courses, offering students core training in the theoretical and methodological foundations of the discipline of Geography. A strength of the program is its dual emphasis on academic and professional development. Students contribute to faculty led research and outreach teams; cultivate relationships with partners in other disciplines and institutions; attend and present research at national and international conferences; and prepare to serve as instructors of their own courses prior to graduation. Doctoral students in the program have established a tradition of professional engagement and leadership in the department, across campus, and within associations such as the American Association of Geographers, and its many specialty groups.

Concentrations

Urban and Regional Analysis

Cities and the regions in which they are embedded are complex, multi-scalar systems. They consist of economic, social, cultural, political, and environmental sub-systems. The Concentration in Urban and Regional Analysis emphasizes the theoretical and empirical analysis of cities and their broader regional, national and global linkages. Students engage in coursework and research that lead to expertise in areas such as economic restructuring; urban planning and policy; quality of life; community health; smart community initiatives; geographies of consumption; central city revitalization; suburban, ex-urban and urban periphery development and change; immigrant settlement and economy; global and globalizing cities and systems; regional and global logistics systems; mobility and transportation; urban ecology; sustainability and environmental justice. The city of Charlotte and its relationship with local, regional, and global urban systems is a common area of focus for graduate students. As one of the most dynamic urban areas in the country, Charlotte offers an ideal context for examining urban complexity at both internal and external scales. Scholarship in national and international comparative studies of urban regional systems is also fostered in this concentration. Students concentrating in Urban and Regional Analysis receive rigorous training in the research approaches, mixed methods, and theoretical constructs necessary to shape urban dynamics through careers in public, private, and nonprofit sector leadership, as well as higher education.

Earth and Environmental Systems

Earth and Environmental Systems is a multidisciplinary concentration in physical geography dedicated to understanding the natural features and phenomena occurring at and near the Earth's surface, as well as the human interactions with these connected systems. Doctoral students have the opportunity to work with faculty on innovative research questions related to

lithosphere, atmosphere, biosphere, and hydrosphere systems at a variety of spatial and temporal scales. Students develop an understanding of the Earth's past, present, and future natural systems, their spatial distributions, and how human societies interact with and influence them. This understanding may ultimately lead to the development of sustainable solutions that could address current or emerging issues of environmental concern. The Department of Earth, Environmental, and Geographical Sciences houses facilities and resources that enable students to pursue cutting-edge, impactful research questions using the latest field, laboratory, and computational methods, as well as Geographical Information Science (GIScience) and remote sensing technologies.

Geographic Information Science

Geospatial data used in research, public affairs, and private business is increasingly pervasive and traceable to geographic positions. The Concentration in Geographic Information Science (GIS) examines the nature of geographic data and information, and methods of capture, measurement, analysis, and modeling of this information to advance our understanding of complex geographic phenomena. Research is articulated around the representation, numerical modeling and dissemination of spatially explicit information with state-of-the-art computational analytics. Ph.D. students in this rapidly evolving field at the interface of data, social, and natural sciences develop proficiency in state-of-the-art geospatial data analytics for an understanding of social and environmental processes of geographic systems across multiple spatial and temporal scales. In conjunction with a critical awareness of the content of geospatial information, students can build expertise in several sub-areas spanning from geocomputational modeling and simulation, cyberGIS, big spatial data analytics, social network analysis, satellite/airborne remote sensing, spatial data mining and machine learning, spatial statistics and geovisual analytics. The internationally respected GIS faculty are well engaged in research on urban and regional socio-economic systems processes, transportation analytics, landscape and environmental systems, public health, energy, land change, sustainability, and resilience.

Admission Requirements

In addition to the general requirements for admission to the UNC Charlotte Graduate School, the following are required for study to the Ph.D. in Geography. Under most circumstances, students admitted to the program will have:

- 1) Master's degree in Geography or field related to the primary emphases of the program. While students may initially be enrolled in the program while finishing their master's degree, documentation of master's degree conferral from issuing university is required for

continuation of Ph.D. in Geography enrollment beyond the first semester.

- 2) A master's level GPA of at least 3.5 out of 4.0.
- 3) In exceptional cases, students with only a completed baccalaureate degree may be admitted. However, this is rare and requires approval from the program Graduate Advisory Committee and the Graduate Program Director following written recommendation from faculty member who agrees to serve as the prospective student's primary doctoral advisor, and who outlines why waiving the master's degree requirement is justified. To be considered for admission with only a completed baccalaureate degree, a student must have an overall undergraduate GPA of at least 3.6, demonstrated research competency, and meet or exceed all other admission requirements. Students without a master's degree or prior master's level coursework should be prepared to complete additional coursework to ensure they have met prerequisites and are ready to engage in Ph.D. level study.
- 4) Transcripts of all previous college coursework. Transcripts are evaluated on the basis the type and range of geographical, spatial, statistical, and technical courses attempted as well as the strength of performance in these areas, and on the depth and suitability of the applicant's preparation for doctoral level coursework and research in the field of geography.
- 5) Graduate Record Examination (GRE) with minimum scores of 150 on both the verbal and quantitative sections and a 3.5 or above on the analytical portions. Applicants must have taken the GRE; no other test is accepted in its place.
- 6) For applicants whose native language is not English, an IELTS overall score of at least 6.5 or a TOEFL exam score of at least 84 on the Internet-based test. The program expects a minimum score in the low to mid 20s on each of the components of the TOEFL. In addition, international students who are supported through a teaching assistantship (TA) will be required to undergo evaluation by the English Language Training Institute (ELTI) at UNC Charlotte prior to beginning their assistantship.
- 7) Proficiency in quantitative methods at a minimum of the linear regression level is expected. If absent, other coursework, as determined by the program's Graduate Advisory Committee, may be required depending on the background of the student.
- 8) GIS proficiency at a minimum of the applications level is expected. If absent, other coursework, as determined by the program's Graduate Advisory Committee, may be required depending on the background of the student.
- 9) Three letters of recommendation, at least two of which must come from faculty in the student's previous academic programs.

- 10) A personal statement which directly addresses why the student wishes to do graduate work in Geography and why they wish to participate in the Ph.D. in Geography program at UNC Charlotte. The statement should address how the program at UNC Charlotte fits career and/or professional goals and how the applicant would benefit from and contribute to the Ph.D. in Geography at UNC Charlotte. This statement is very important in determining the applicant's commitment to graduate education and to a professional career in geography or a related field.

Degree Requirements

51 credit hours of approved coursework is required, encompassing 15 credit hours of required courses, 18 credit hours of elective courses and 18 dissertation credit hours. Students are also required to pass a three-part qualifying examination, as well as an oral defense of both the dissertation proposal and the final dissertation. In addition to program requirements, all doctoral students are required to successfully complete a non-credit bearing course for academic integrity.

Academic Integrity Course

GRAD 8990 - Academic Integrity (0)

Required Courses (15 credit hours)

All core courses must be taken in residence at UNC Charlotte.

GEOG 8124 - Seminar in Geographic Theory and Practice (3)

GEOG 8125 - Geographic Information Science and Technology (4)

GEOG 8131 - Research Design Fundamentals (3)

GEOG 8632 - Ph.D. Professional Development Seminar (1)
(taken twice for a total of 2 credit hours; once in the first year during the Fall semester and once in the third year during the Fall semester)

GRAD 8104 - Spatial Statistics (3)

or GEOG 8115 - Qualitative Methods in Geography (3)

Elective Courses (18 credit hours)

In consultation with their Faculty Advisor, students select and successfully complete a minimum of 18 credit hours of elective courses that build towards measureable expertise in the discipline, the student's chosen concentration and the methods and approaches central to the conducting of rigorous geographic research. Of the 18 credit hours of elective courses, no more than 9 credit hours can come from outside the department (GEOG or ESCI).

Dissertation Research (18 credit hours)

GEOG 8901 - Dissertation (1 to 9)

Degree Total = 51 Credit Hours

Grade Requirements

All graduate students are subject to academic suspension and/or termination. Department academic standards deviate slightly from University policies stated in appropriate catalogs. A student must maintain a cumulative average of 3.0 in all coursework taken in the program. An accumulation of one (1) marginal (C) grade results in the student being placed on probationary status within the program and could lead to the student being required to re-take the course, and a potential loss of funding if the student is receiving University-sourced funding. An accumulation of two (2) marginal (C) grades results in suspension of the student's enrollment in the graduate program. A graduate student whose enrollment has been suspended because of grades is ineligible to register in any semester or summer session unless properly reinstated through the suspension appeal process. A maximum of one (1) C grade can be applied towards the PhD. As such, if a student is reinstated following a grade related suspension, they must retake at least one of the courses for which the C grade was initially issued and achieve a grade of B or above. An accumulation of three (3) marginal (C) grades or one (1) unsatisfactory (U) or one (1) NC grade results in termination of the student's enrollment in the graduate program. Furthermore, a second failure in the qualifying examinations; the dissertation proposal defense; or final dissertation defense also results in dismissal from the program. In order to continue a program of study, the student must pursue reinstatement through the termination appeal process or wait a period of two years before applying for readmission to the program.

Transfer Credit

A maximum of 9 credit hours or three courses of Ph.D.-level elective coursework can be transferred from a graduate program from a college or university accredited by an accepted accrediting body as part of the 51-credit hour requirement. This includes credit hours earned in a master's program at UNC Charlotte. All transfer credit requires Advisor recommendation and Program Director approval, and must be in compliance with program and Graduate School policy. Internship, dissertation, thesis, or capstone research hours are not eligible for transfer.

Qualifying Examination

Following successful completion of all required core courses (with the exception of a student's 2nd enrollment in GEOG 8632) and at least 15 credit hours of elective coursework, and upon the recommendation of the Faculty Advisor, students sit for a three-part, written, qualifying examination. For full-time students, this generally occurs no later than the end of the 4th semester or early in the 5th semester of enrollment in the program. Part I of the qualifying examination addresses the theoretic and contemporary literature of geography generally covered

in the required coursework. Part II assesses student competency in research methods and techniques. Part III evaluates student competence in their sub-field of research specialization.

The qualifying examination is set and graded by an Examination Committee composed of faculty who teach in the doctoral program and from whom the student has taken coursework relevant to the exam. More specifically, Part I is set and graded by the instructor of GEOG 8124; Part II is set and graded by the instructor(s) who taught the student one or more of their core methods or techniques courses; and Part III is most commonly set by the student's primary advisor with whom the student has most closely worked to develop her or his primary area of sub-disciplinary expertise. The Examination Committee is appointed by the Geography Doctoral Program Director in consultation with the student's Faculty Advisor. All three components of the examination must be completed within a one month timeframe.

If a student fails the qualifying examination or any portion of the exam, they must wait until the next semester to retake the failed part or parts of the examination. During the interim period, the student may be required to retake courses in which the Examination Committee determines there is a deficiency. If a student fails the qualifying examination or any portion of the exam a second time, the program will request termination of the student's enrollment for a lack of satisfactory academic progress.

Faculty Advisor and Dissertation Committee

All students in the program have both a Faculty Advisor and Dissertation Committee. The Faculty Academic Advisor is assigned upon admission to the program and assists the student in formulating a Program of Study, including a potential dissertation topic. The Faculty Academic Advisor often continues to serve as Chair of the Dissertation Committee who must be a member of the Department of Earth, Environmental, and Geographical Sciences. The Dissertation Committee should have at least three additional members, two of whom are chosen by the student and are usually members of the Department of Earth, Environmental, and Geographical Sciences. The final member of the Dissertation Committee is a Graduate School representative appointed by the Dean of the Graduate School. All members of the Dissertation Committee must be members of the Graduate Faculty.

Dissertation Proposal and Advancement to Candidacy

Advancing to candidacy requires that the student pass the qualifying exam and write and successfully defend a dissertation proposal. The proposal must be submitted to the student's Advisory Committee for preliminary approval

and then to the Program Coordinator and the Dean of the Graduate School. Successful defense of the dissertation proposal is followed by advancement to candidacy.

Dissertation

The culminating product of the program is the student's dissertation. Each dissertation is expected to be based on independent and original research which contributes to the body of knowledge in the discipline of Geography and to the student's sub-field of study. Dissertations can be prepared and submitted in monograph format or a three-article dissertation format following the customized requirements for the PhD in Geography Program.

Candidates must supply a copy of their dissertation to their committee at least three weeks prior to the final defense. The document is evaluated through an oral defense with the student's dissertation committee and other graduate faculty as per Graduate School guidelines. Only after all recommended changes flowing from the oral defense are made and approved by the faculty advisor and dissertation committee may a student submit her/his final dissertation to the Graduate School. The final defense must be held on campus at UNC Charlotte. Candidates must publicly announce the date and time for the final defense at least two weeks prior to the event.

If a student fails either the written or oral portion of the dissertation defense, they must wait until the next semester to redefend. During the interim period, the student works closely with her/his Advisor and Dissertation Committee to address areas where deficiencies were identified. If a student fails the dissertation defense a second time, the graduate program will request termination of the student's enrollment for a lack of satisfactory academic progress.

Time Limits for Completion of the Degree

It is generally expected that full-time students complete coursework within a two-year timeframe and the dissertation completed one to two years later. Students must achieve admission to candidacy within six years after admission to the program. Regardless of whether a student has proceeded through the program full-time or part-time, all courses applied towards the doctoral degree must have been taken within nine years after first registration as a doctoral student (regardless of whether courses were taken at UNC Charlotte or another institution). Further, the oral examination in defense of the dissertation must be passed within five years after being advanced to candidacy.

Assistantships and Other Support

The Ph.D. in Geography program at UNC Charlotte endeavors to secure funding support for our most competitive students in one of three ways: 1) externally funded Research Assistantships (RAs) offered by faculty

through their granting activity and research programs; 2) program or university funded Graduate Assistantships (GAs) that can be teaching focused; research focused; administration focused or a combination thereof; or 3) externally funded scholarships, fellowships, or internships.

Many of our doctoral program faculty have active and externally funded research programs that are core sources of funding support (and training) for doctoral students.

For students not supported through advisor-funded RAs, the program offers a number of competitive Graduate Assistantships (GAs) which are awarded for a single semester or for an entire academic year (2 semesters or 9 months). Program Assistantships are renewable (based on academic and assistantship performance; advisor recommendation and program director approval) but generally only up to the end of the 8th semester or 4th academic year dated from a student's initial semester of enrollment in the program. Such GAs are normally scheduled for 16 weeks per semester and require the student to work for 20 hours per week. Graduate Assistantship assignments range from support of departmental teaching in which a student serves as either a teaching assistantship to faculty or, for more advanced students, as instructor of record for their own course; to support of faculty led research projects, outreach endeavors or other professional activities; to administrative support of departmental or programmatic initiatives. University policy dictates that acceptance of a Graduate Assistantship prohibits students from working for more than 20 hours per week in any paid activity on or off campus.

Students funded through faculty-supported RAs or awarded one of our program's competitive GAs are nominated for UNC Charlotte's Graduate Assistant Support Plan (GASP). GASP is a competitive support package used to attract top doctoral students to UNC Charlotte. If successful in the competition, doctoral students supported on a GA (or other qualifying award) receive tuition and health insurance for the academic year (fall and spring semesters). GASP is renewable for a limited number of semesters as per Graduate School guidelines. In addition to GASP, the UNC Charlotte Graduate School administers a number of philanthropic fellowships and awards for which eligible students are encouraged to apply.

Our doctoral students have a strong record of success in fellowship and scholarship competitions at the national level. Working in partnership with their academic advisors, Geography doctoral students are strongly encouraged to apply for external support from agencies such as, but not limited to, National Science Foundation, National Institutes of Health, Society of Women Geographers, United States Environmental Protection Agency, National Oceanic and

Atmospheric Administration, and Association of American Geographers. Professional development is an important cornerstone of the doctoral program. As such, Ph.D. in Geography students are encouraged to present their independent and assistantship research at regional, national, and international academic and professional conferences. Financial support for these presentations is often available from the program (subject to budget conditions). Additionally, many of our doctoral students are offered opportunities to work with faculty over the summer months as Graduate Assistants supporting research, teaching and/or outreach initiatives that are either funded through faculty grants or contracts or through the awarding of a competitive summer GA offered through the Ph.D. in Geography program itself.

M.A. in Geography

The Master of Arts in Geography emphasizes applying skills, methods, and theories to solve geographic problems in contemporary society. Students gain a solid foundation in spatial, locational, and planning theory, research methods (quantitative and qualitative), and Geographic Information Science and Technology (GIS&T).

Building on the strengths and research interests of the graduate faculty in the Department of Earth, Environmental, and Geographical Sciences (EEGS) and colleagues across campus, students have the opportunity to work with their advisors to craft a program that works best for their objectives in the areas of human-environment interactions and sustainability, urban and regional analysis, community planning, GIScience and geospatial analytics, environmental hazards and health, or a combination thereof.

Admission Requirements

In addition to the general requirements for admission to the UNC Charlotte Graduate School, the following are required for study to the M.A. in Geography:

- Under most circumstances, students admitted to the program must have: a **B.A. or B.S. degree in Geography** or field related to the primary emphases of the program.
- **Grade Point Average (GPA):** In general, the department would prefer an overall undergraduate GPA above 3.1 (or a 3.1 for the last 2 years) and a GPA of 3.2 in the major. However, averages less than these do not exclude applicants if the other elements of the application are strong.
- **Transcripts of College Coursework:** Transcripts are evaluated on the basis of types of courses attempted, range of geography, statistical, and computer coursework attempted. Not only is the applicant evaluated on the strength of the performance in these

areas, but also on the range, depth and suitability of the applicant's preparation for graduate level coursework.

- **Graduate Record Examination (GRE):** The GRE is optional for all applicants.
- **TOEFL exam scores** of at least 84 on the Internet-based test for applicants whose native language is not English. The program expects a minimum score in the low to mid 20s on each of the components of the TOEFL. In addition, international students who are supported through a teaching assistantship (TA) are required to undergo evaluation by the English Language Training Institute (ELTI) at UNC Charlotte prior to beginning their assistantship.
- **Letters of Recommendation:** Three letters of reference are required. Letters from college or university teachers who have worked with and/or taught applicants are preferred. These letters are evaluated on the basis of how well the applicant is suited in terms of intellect, motivation and temperament to do graduate coursework.
- **Personal Essay:** Applicants must write a personal essay which directly addresses why they wish to do graduate work in geography and why they wish to participate in the M.A. program at UNC Charlotte. They should address directly how the program at UNC Charlotte fits their career and/or professional goals and how they would benefit from and contribute to the M.A. in Geography at UNC Charlotte. This essay is very important in determining the applicant's commitment to graduate education and to a professional career in geography or a related field. Careful consideration of what goes into this essay is time well spent.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Prerequisite Requirements

All prospective graduate students must demonstrate competence in the undergraduate subject matter in their area of study. While the Department does not require that applicants have a degree in Geography, prospective graduate students should provide evidence that they are prepared to immediately take full advantage of graduate level coursework in Geography.

Students applying to the program should, at a minimum, be familiar with the concepts and materials offered in courses such as basic Economic Geography, Introduction to Spatial

Analysis, Location Theory, and Introduction to Research Methods or Statistics. Any student wishing to pursue additional training in Geographic Information Systems (GIS) should have basic cartography preparation and computer file management and database skills.

Assistantships

Graduate assistantships are awarded on a competitive basis and arranged for either one entire semester or for an entire academic year (2 semesters or 9 months). They are normally scheduled for 15 weeks per semester and the student works 20 hours per week.

Degree Requirements

The M.A. in Geography requires at least 33 credit hours of graduate work. All students must, as a part of their total 33 credit hours, complete a minimum of 6 credit hours of capstone credit. In addition, all students must pass an oral defense of both the proposal and the final version of their capstone project.

Up to 9 credit hours may be taken in related work, which includes all transfer credit, credit by exam, and coursework in other departments at or above the 5000 level. At the department's discretion, transfer credit totaling up to 6 credit hours may be accepted from a college or university accredited by an accepted accrediting body. No student may take more than six credit hours in graduate-level independent study (GEOG 6800).

* Students must work closely with their advisors to determine the methods or research design courses that will best meet their research and career objectives.

Elective Courses:

- Other 5000- or 6000-level courses in Geography with a minimum of 12 credit hours
- Related work (outside the department) or transfer credits in courses numbered 5000 and above with a maximum of 12 credit hours

Required Courses

GEOG 6124 - Seminar in Geographic Theory and Practice (3)

Two methods or research design courses from the list below (or another with approval):

GEOG 5210 - Urban Planning Methods (3)
 GEOG 6115 - Qualitative Methods in Geography (3)
 GEOG 6120 - Spatial Statistics (3)
 GEOG 6125 - Geographic Information Science and Technology (4)
 GEOG 6131 - Research Design Fundamentals (3)
 GRAD 6101 - Linear Regression (3)

Electives

Other 5000- or 6000-level courses in the Department with a minimum of 9 credit hours

Related work (outside the department) or transfer credits in courses numbered 5000 and above with a maximum of 9 credit hours

Degree Total = 33 Credit Hours

Advising

Upon admission to the program each student will be assigned a faculty advisor from the student's declared area of interest. This advisor will help guide the student through the design and implementation of a program of study tailored to the student's specific needs and career goals. The advisor will be available to the student for advice on academic and other matters. Students must confer with their advisors regularly concerning academic matters.

More often than not, students will not work with the same advisor throughout the entire program. Once the student has become familiar with the program and the faculty, it is possible to change advisors by obtaining prior approval from the faculty member with whom the student wishes to work. Advisors should be chosen to match, as nearly as possible, the student's academic and career interests. No student will be allowed to register for a course without an advising session with their advisor. The advisor will remove the advising hold at this session.

All students are required to formulate a complete plan for their M.A. during pre-registration for second semester. This plan must be approved by their advisor and will serve as a guide to their course of study while at UNC Charlotte.

Academic Standards

From the date of admission to graduation, the Department conducts a continuous review of student academic and professional performance. In addition to evaluations conducted within the courses taken by students, the faculty conduct a thorough review of student performance on a regular basis. Continuation in the program is contingent upon a favorable review during these evaluations. Students who consistently show borderline course performance, who are not developing good applied skills in the practice of their chosen area of study, who fail to complete coursework on a timely basis, or who otherwise perform unprofessionally or unsatisfactorily, may be required to complete additional courses or may be terminated from the program.

All graduate students are subject to academic suspension and/or termination. Department academic standards deviate slightly from University policies stated in appropriate catalogs. A student must maintain a cumulative average of

3.0 in all coursework taken in the program. An accumulation of one (1) marginal (C) grade results in the student being placed on probationary status within the program and could lead to the student being required to re-take the course, and a potential loss of funding if the student is receiving departmental or internship funding. An accumulation of two (2) marginal (C) grades results in suspension of the student's enrollment in the graduate program. A graduate student whose enrollment has been suspended because of grades is ineligible to register in any semester or summer session unless properly reinstated through the suspension appeal process. An accumulation of three (3) marginal (C) grades or one (1) unsatisfactory (U) or one (1) NC grade results in termination of the student's enrollment in the graduate program. In order to continue a program of study, the student must pursue reinstatement through the termination appeal process or wait a period of two years before applying for readmission to the program.

Special care should be exercised in completing the requirements of a course in which a grade of Incomplete (I) is received. With the exception of GEOG 6131, where incomplete grades are not normally given, incomplete work must be finished during the next semester in residence, but not later than 12 months after the end of the term in which the "I" was assigned, whichever comes first. However, the course instructor has the option of specifying a completion deadline anytime within the 12-month period. If the "I" is not removed during the specified time, a grade of U is automatically assigned. In any case, a student will not be allowed to schedule the final comprehensive examination until all incomplete grades are removed. Also, with the exception of GEOG 7900, no student may have more than two incomplete grades at any time. Students with two or more incompletes may not register for another term.

Research Options

The program requires all students to complete an individual capstone research project. Although individual research experiences may differ, students should pursue research experiences that are appropriate to departmental faculty resources, individual student's programs and career goals, and the availability of opportunities that exist to work with allied agencies or clients on or off campus. One of three options, depending on the previously stated stipulations, is available: 1) a research experience similar to that of a traditional academic capstone; 2) a research experience which involves a paid internship funded by and arranged with a public or private agency or client; and 3) a research experience involving an internship that is not funded, but arranged with a public or private agency or client.

Each of these options fulfills program requirements equally. Each produces a finished research effort of thesis quality. These options provide a choice for students to pursue a research problem in a direction of their individual interest.

In all cases, students must work closely with their advisor and program committee to choose the option which best fits both their particular program and prevailing circumstances.

Not every student can expect to engage in a capstone research project that is a paid internship because the number of students frequently exceeds a matching number of opportunities funded in that manner. Unpaid internships provide the same caliber of experience and training in an applied environment. In some cases, that experience may relate student with nonprofit agencies or social services that simply do not have the resources to fund an internship. In either case, the topic of the internship is defined by the client's problem or needs.

Committees

All GEOG 7900 Research Projects are evaluated by a committee of faculty. Committees must have a minimum of three members composed of the graduate faculty of the department--or related departments. Committee members may include outside members from other departments or internship coordinators from off-campus agencies when appropriate.

Proposal and Capstone Defense

To complete the program, all students are required to pass an oral defense of both the proposal and the final version of their individual capstone project. It is the responsibility of the advisor or committee chair, in consultation with the student, to arrange both proposal and capstone defense.

The Proposal

Students must prepare and orally present a written research proposal that clearly outlines the purpose and scope of their research. Students should be prepared to respond to questions from their research committee, including questions on general topics addressed in their prior coursework. The proposal presentation is generally completed at the beginning (or during) the 3rd semester for full-time students.

The Defense

The defense of the individual research project (GEOG 7900), the capstone, is generally administered at the discretion of the committee chair and the student. When the advisor is satisfied that the student's research and writing has progressed sufficiently, the research document is provided to the other members of the independent research committee; if they agree that the document is ready for a defense, an oral exam is scheduled.

M.S. in Earth Sciences

The Department of Earth, Environmental, and Geographical Sciences offers a Master of Science in Earth Sciences

degree with opportunities for study and research in the areas of geology, hydrology, atmospheric science, surface processes, environmental science, remote sensing, and geospatial analysis. Graduate students have access to faculty expertise in those topics, as well as access to field, laboratory, and computing facilities. The department webpage is the most up-to-date source of information about current faculty expertise and resources.

The program can be completed in two years of full-time study. Students choose one of two options with different degree requirements: 1) a course-only option that emphasizes the core knowledge and skills necessary for practice in Earth Sciences professions via coursework, or 2) a research option in which students engage in original Earth Sciences research in collaboration with a faculty advisor and complete coursework centered on that research.

Graduates will be prepared for careers in environmental consulting in ecosystem restoration, hydrology, geology, air quality, water quality, climate, energy resources, or energy planning; meteorologists in government, military, or private industry; climatologists in city, state, regional, and federal agencies; geologists in environmental, energy, or mining industries, or government agencies; environmental regulation in federal, state, and local agencies; environmental educators in K-12 schools, colleges, and state agencies; work for non-profits; or advisors on science policy at all levels of government.

Furthermore, the research option prepares students for Ph.D. programs in atmospheric science, geology, geosciences, geography, Earth sciences, or environmental Sciences.

Admission Requirements

All applications for admission are reviewed by the Department of Earth, Environmental, and Geographical Science's Graduate Advisory Committee. The department admits applicants on a competitive basis as space in the program allows. In addition to Graduate School admission requirements, the following are required for the program:

- *Grade Point Average (GPA):* The department expects an overall undergraduate GPA of at least 3.0 on a 4.0 point scale. However, exceptions may be made if other elements of the application are strong.
- *Reference Letters:* Three letters of reference are required. Letters from college or university instructors who have worked with or taught applicants are preferred. These letters are evaluated on the basis of how well the applicant is suited in terms of intellect, preparation, maturity, and motivation to perform graduate work.
- *Personal Statement:* Applicants must write a personal statement that directly addresses their reasons for

conducting graduate work, as well as their desire to participate in the M.S. in Earth Sciences program at UNC Charlotte. Applicants should comment on their expectations regarding the benefits of a M.S. and how the program at UNC Charlotte fits their career and professional goals. Applicants to the research option of the program should identify potential advisors with whom they would like to work and explain why those advisors were selected. Applicants are strongly encouraged to contact potential advisors prior to submitting an application.

- *Scores on the Graduate Record Exam (GRE):* In general, the department expects applicants to score above the 50th percentile on each exam section with a minimum score of 300 on the combined verbal and quantitative portions (equivalent to a minimum combined score of 1000 if taken before 2011). Lower scores will not automatically exclude applicants if the remainder of the applicant's file is strong.
- *Transcripts of College Coursework:* Transcripts of all previous college study must be submitted. They are evaluated on the basis of performance across a range of Earth and environmental sciences, physical sciences, and mathematics courses in order to determine the applicant's preparation for graduate level coursework.
- *Language Requirements:* International applicants whose native language is not English must earn a total score of at least 83 (Internet-based) or 557 (paper-based) on the Test of English as a Foreign Language Exam (TOEFL). This requirement does not apply to U.S. citizens or native English speakers.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Additional Prerequisite Requirements

(Minimum requirements in addition to those enforced by the Graduate School)

All prospective graduate students must demonstrate competence in undergraduate subject matter in their area of study. While the department does not require that applicants' bachelor's degree be in Earth Sciences or a related field, prospective graduate students should provide evidence that they are academically prepared to participate in graduate level coursework in disciplines encompassed by the M.S. in Earth Sciences program at UNC Charlotte.

Students applying to the program should, at a minimum, be familiar with the concepts and materials offered in introductory courses including: Physical Geography or Physical Geology, Chemistry I, Physics I, and calculus-based Mathematics.

Students entering the program with notable deficiencies may be required to complete undergraduate level courses to address those deficiencies in addition to graduate level courses required by the program. The required deficiency courses are mandated at the discretion of the advisor or the Graduate Program Director; these courses typically do not supply graduate credit nor count towards required credits for the M.S. in Earth Sciences program.

All decisions concerning the equivalency of courses in an applicant's transcript to those listed as minimum requirements for entry to the M.S. in Earth Sciences are the responsibility of the Graduate Program Director.

Degree Requirements

The M.S. in Earth Sciences program requires a minimum of 30 credit hours of graduate coursework. Students must choose one of two options to complete the program: 1) a course-only option, or 2) a research option.

Course-Only Option

Students must complete 13-16 credit hours of required coursework that includes a graduate seminar and courses that span the department's areas of expertise in Earth Sciences. The remaining credit hours consist of 5000- or 6000-level elective courses of the student's choosing.

Required Courses (13-16 credit hours)

Graduate Seminar (2 credit hours)

Students take this seminar twice for a total of two credit hours:

ESCI 6600 - Earth Sciences Graduate Seminar (1)

Advanced Subject Matter Courses (6 credit hours)

Select two of the following that cover advanced subject matter related to Earth Sciences:

ESCI 6202 - Earth Systems Analysis: Biogeochemical Cycles (3)

ESCI 6222 - Quaternary Paleoenvironmental Sciences (3)

ESCI 6226 - Landscape Ecology (3)

ESCI 6227 - Ecosystem Restoration (3)

GEOL 6101 - Earth Systems Analysis: Geodynamics (3)

GEOL 6102 - Earth Systems Analysis: Paleoenvironments (3)

Advanced Techniques Courses (5-8 credit hours)

Select two of the following that cover advanced techniques employed by Earth scientists:

ESCI 6105 - Landscape Assessment (4)

ESCI 6120 - Numerical Modeling of the Earth System (3)

ESCI 6229 - Geochemical Tracers and Hydrologic Applications (3)

GEOG 6125 - Geographic Information Science and Technology (4)

GRAD 6101 - Linear Regression (3)

GRAD 6340 - Data Analysis and Presentation for Impact (2)

Elective Courses (14-17 credit hours)

Select from the following courses within the Department of Earth, Environmental, and Geographical Sciences :

ESCI 5XXX-6XXX - Earth Sciences Elective

GEOG 5XXX-6XXX - Geography Elective

GEOL 5XXX-6XXX - Geology Elective

It is anticipated that students primarily select courses from the Department of Earth, Environmental, and Geographical Sciences, but they may also choose coursework in biology, chemistry, computer science, engineering, mathematics, and physics in support of particular emphases within the program. For example, certain geo-technology or environmental engineering courses in the Department of Civil and Environmental Engineering may be appropriate for the student pursuing problems in environmental Earth Sciences. Students examining the interaction of geology and the biosphere may include Ecology or Botany courses in the Department of Biological Sciences or Organic Chemistry courses in the Department of Chemistry in their program of study. Students must meet other departments' course prerequisite requirements or receive permission from the instructor before registering for out-of-department courses. Up to 6 credit hours of independent study may be applied as elective coursework.

Comprehensive Examination

To complete the program, each course-only option M.S. student must pass a written comprehensive examination testing the student's knowledge and understanding gained in required and elective coursework. The student must respond to three questions of the Graduate Program Director's choosing, each covering material from a different course (both required and elective courses are eligible) in the student's program of study. The written comprehensive exam is normally taken during the penultimate semester and in no case should the student take this exam before accumulating 21 credit hours of completed or in-progress coursework. This exam may not be administered if the student has outstanding Incomplete grades in any coursework. If a student does not successfully answer any question(s) on the exam, the student may retake the question(s) one time in the final semester.

Degree Total = 30 Credit Hours

Research Option

The 30 credit hour minimum for the research option includes 2 credit hours of ESCI 6600, at least 9 credit hours

of ESCI 6900, and at least 9 credit hours of 5000- or 6000-level course credits exclusive of ESCI 5800, ESCI 6800, GEOG 6800, and GEOL 6800. The total degree hours must consist of at least 18 credit hours at the 6000 level, including ESCI 6600 and ESCI 6900. *Note: Additional credit hours of ESCI 6900 beyond the required 9 credit hours may be applied.*

Required Courses (11 credit hours)

ESCI 6600 - Earth Sciences Graduate Seminar (1) (*taken twice for a total of 2 credit hours*)

ESCI 6900 - Earth Sciences Research (1 to 9) (*taken for a total of 9 credit hours*)

Earth Sciences Research

Students can pursue research experiences that are appropriate to individual student's interests and experience, departmental faculty resources, and the availability of opportunities that exist to work with allied agencies or clients on or off campus. The research experience can be in the form of a research project or a thesis. The only difference between the requirements for these two formats is that the thesis must adhere to the deadline and formatting requirements for thesis submission of the UNC Charlotte Graduate School, whereas the project must adhere to the deadline requirements for project completion but is not subject to a formatting review by the Graduate School. Both formats have identical expectations regarding scope, originality, and quality of the work completed. Students wishing to complete a project instead of a thesis must obtain advisor permission to do so.

For both the thesis and project, the student must prepare and orally present a written research proposal that clearly outlines the purpose and scope of their research. At the presentation, students should be prepared to respond to questions from their research committee, including questions on general topics addressed in their prior coursework. It is expected that the proposal presentation occur by the end of the second semester for full-time students, and must be completed no later than the end of the third semester for full-time students. The proposal presentation may not occur in the same semester as the defense of the final research document. If the proposal presentation is not completed by the end of the third semester for full-time students, the student is strongly encouraged to transfer to the course-only option (any research credits already taken may be graded by the instructor and applied towards the course-only option as elective credits).

The final results of all research projects and theses must be presented in a written research document. The research document must be formally reviewed and approved by a majority vote of the student's research committee. Research projects and theses must also be orally defended (see below).

Committee

All research proposals and final projects and theses are evaluated by a faculty committee known as the research committee. Research committees must have a minimum of three members composed of the graduate faculty of the Department or associated departments. Additional members are acceptable and in many cases outside members, such as internship coordinators from off-campus agencies, are advisable.

Defense of the Research Project or Thesis

When the advisor is satisfied that the student's research and writing have progressed sufficiently, the research document is provided to the other members of the research committee. If they agree that the document is ready for a defense, an oral defense is scheduled. At least one week prior to the defense, the student must provide a digital version of the research report or thesis to the research committee and place a digital copy in the appropriate public online folder hosted by the Department for review by all interested faculty and students. At the same time, the advisor must formally notify all faculty and students in the Department of the date, time, place, and topic (title with abstract) of the defense.

Elective Courses (19 credit hours)

Select from courses within the Department of Earth, Environmental, and Geographical Sciences :

ESCI 5XXX-6XXX - Earth Sciences Elective

GEOG 5XXX-6XXX - Geography Elective

GEOL 5XXX-6XXX - Geology Elective

It is anticipated that students primarily select courses from the Department of Earth, Environmental, and Geographical Sciences, but they may also choose coursework from biology, chemistry, computer science, engineering, mathematics, and physics in support of particular emphases within the program. For example, certain geotechnology or environmental engineering courses in the Department of Civil and Environmental Engineering may be appropriate for the student pursuing problems in environmental Earth Sciences. Students examining the interaction of geology and the biosphere may include Ecology or Botany courses in the Department of Biological Sciences or Organic Chemistry courses in the Department of Chemistry in their program of study. Students must meet other departments' course prerequisite requirements or receive permission from the instructor before registering for out-of-department coursework.

Degree Total = 30 Credit Hours

Grade Requirements

Students are expected to achieve grades of A or B in all coursework taken for graduate credit and must have at

least an average of B (3.0) in order to graduate. An accumulation of more than two grades of C results in suspension of the student's enrollment in the graduate program. A grade of U results in the immediate suspension of the student's enrollment in the graduate program. Readmission to the program requires approval of the Graduate Program Director, Department Chair, and Dean of the Graduate School.

Advising

A student's advisor guides the student through the design and implementation of a program of study and research, if applicable, tailored to the student's specific needs and career goals and the Department's research and teaching missions. The advisor generally is available to the student for advice on academic and other problems, and the advisor sets expectations for student performance beyond coursework. Course-only option students are advised by the Graduate Program Director, whereas an advisor is assigned by the Graduate Program Director to each research option student at the time of their admission into the program. Every effort is made to match research option students with advisors who have similar research interests. Research option students may change advisors by obtaining advance permission from the faculty member with whom they wish to work, i.e., the new advisor. No student will be allowed to register for courses without permission of their advisor.

Assistantships

Assistantships may be offered to research option students. Assistantships are much like a part-time job, offering valuable training opportunities and work experience that ideally fit the student's academic interest. The nature of a research assistantship depends entirely on the needs of the Department of Earth, Environmental, and Geographical Sciences or supervising faculty member. Teaching assistantships are assigned on the basis of the student's academic background.

Graduate assistantships are arranged for either one entire semester or for an entire academic year (two semesters or nine months). They are normally scheduled for 16 weeks per semester and the student is expected to work 20 hours per week. The department makes every effort to provide funding to every full-time research option student in the program.

Graduate Coursework

The M.S. in Earth Sciences graduate program generally follows a traditional numbering scheme with 5000- and 6000-level courses. The 5000-level numbers identify courses that cover accepted bodies of knowledge within the Earth Sciences with the emphasis placed on mastery and critical assessment of the theoretical and empirical foundations within the discipline. The 6000-level courses are divisible into three categories. (1) The first category is

the Earth Systems topic courses, wherein graduate students review and analyze the dominant current working hypotheses that drive contemporary research within conceptual areas such as geodynamics, global biogeochemical cycles, climate change, severe weather dynamics, or urban ecology. (2) The second 6000-level category is the common core seminar course, wherein graduate students discuss holistic themes and discipline-specific issues in the Earth Sciences over the course of two separate fall semesters. (3) The third 6000-level category is the directed research course that provides the framework for research option students to complete the research requirements within their course of study.

Plan of Study

All students are required to formulate a complete plan for their M.S. before completion of the second semester for full-time students. For course-only option students, this plan includes all coursework that will be completed during the degree. For research option students, the plan of study includes the names of the student's research committee members, a thesis/research project title, the semesters during which the proposal and final defenses are planned, and all coursework that will be completed during the degree. The plan of study must be approved by the Graduate Program Director and all committee members (research option students only), and serves as a guide to coursework and research while at UNC Charlotte.

Transfer Credit

Up to 6 graduate credit hours may be accepted as transfer credit. Only courses with grades of A or B earned at an accredited university are eligible. Transfer credits are not automatic and require the approval of the Graduate Program Director and the Graduate School. The amount of transfer credit may not exceed the limit set by the Graduate School (6 credit hours).

Graduate Certificate in Geographic Information Science and Technology

The Graduate Certificate in Geographic Information Science and Technology (GIS&T) program provides students in-depth training and education in GIS. Students with different backgrounds (e.g., biology/ecology, geography, earth sciences, meteorology, engineering, social science, public health and health analytics, data science, and computer science) are exposed to knowledge in cutting-edge geospatial theory, methods, and technologies, including GIS, spatial data analytics, geoAI, cartography, and geovisualization, and remote sensing. Students develop geospatial skills that are of great help in their domain-specific problem-solving using

state-of-the-art GIS. The GIS training that students receive from the graduate certificate program makes them highly competitive in their future careers in industry and in academia.

Admission Requirements

The certificate program is open to all applicants who either hold a bachelor's degree from a college or university accredited by an accepted accrediting body or are enrolled and in good standing in a graduate degree program at UNC Charlotte. Applications for admission are considered as they are received, and admissions are ongoing. All students are admitted to the Graduate School in a special category for certificate programs. Students currently enrolled in the M.A. in Geography program within the Department of Earth, Environmental, and Geographical Sciences are also eligible to apply for the certificate.

To apply for the admission to the certificate program, applicants are required to submit:

- A completed Graduate Admissions application form to Graduate Admissions with a statement of professional goals
- One letter of recommendations from an academic or professional source
- For select international applicants, TOEFL or other score of language proficiency accepted by the UNC Charlotte Graduate School
- GPA: In general, the department would prefer an overall undergraduate GPA above 3.0 (or a 3.0 for the last 2 years) on a 4.0 scale. However, averages less than these will not exclude applicants if the other elements of the application are strong
- Official transcripts from all post-secondary educational institutions

Certificate Requirements

At least 13 total credit hours are required to obtain a Certificate in Geographic Information Science and Technology from the Department of Earth, Environmental, and Geographical Sciences. Students are required to take the core course which focuses on the fundamentals of GIS&T and then three elective courses from the list below.

Core Course (4 credit hours)

Select one of the following:

GEOG 6125 - Geographic Information Science and Technology (4)

GEOG 8125 - Geographic Information Science and Technology (4)

Elective Courses (9 credit hours)

Select three of the following:

ESCI 5170 - Fundamentals of Remote Sensing (4)

ESCI 5180 - Digital Image Processing in Remote Sensing (4)

GEOG 5000 - Topics in Geography (3) *

GEOG 5103 - Computer Programming for GIS

Applications (3)

GEOG 5131 - Environmental Modeling with GIS (4)

GEOG 5132 - Spatial Modeling for Social and Economical

Applications (3)

GEOG 5150 - Spatial Database Development with GPS

and GIS (3)

GEOG 5180 - Web GIS (3)

GEOG 6000 - Topics in Urban and Regional Analysis (3) *

or GEOG 8000 - Topics in Urban and Regional

Analysis (3) *

GEOG 6030 - Topics in Geographic Techniques (3) *

or GEOG 8030 - Topics in Geographic

Techniques (3) *

GRAD 6104 - Spatial Statistics (3)

or GRAD 8104 - Spatial Statistics (3)

GEOG 6120 - Spatial Statistics (3)

or GEOG 8120 - Spatial Statistics (3)

GEOG 6205 - Geovisualization (3)

or GEOG 8205 - Geovisualization (3)

GEOG 6282 - CyberGIS and Big Data (3)

or GEOG 8282 - CyberGIS and Big Data (3)

GEOG 6408 - Spatial Optimization (3)

or GEOG 8408 - Spatial Optimization (3)

GEOG 6800 - Directed Problems in Geography (1 to 4) *

or GEOG 8800 - Directed Problems in

Geography (1 to 4)

** With permission of Certificate Director only*

Certificate Total = 13 Credit Hours

Grade Requirements

Students must earn a grade of C or above in all courses toward the certificate.

ENGLISH

- **M.A. in English**
 - Applied Linguistics
 - Children's Literature
 - Composition/Rhetoric
 - Creative Writing
 - English Education
 - English for Specific Purposes
 - Literature
 - Technical/Professional Writing
- **M.A. in English/M.F.A. in Creative Writing Dual Degree**
- **Graduate Certificate in Applied Linguistics**
- **Graduate Certificate in Technical/Professional Writing**

Department of English
english.charlotte.edu

M.A. in English

The Master of Arts in English degree program is designed to accommodate a wide variety of students: those seeking personal enrichment through increased knowledge and understanding; those preparing to pursue a Ph.D. in English or other advanced professional degrees; and those seeking professional advancement in such fields as writing, publishing, or teaching on the primary, secondary, or college levels. There are eight concentrations available within the M.A. in English. The Department of English offers a broad range of courses in literature, writing, and language.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for study in English:

- 1) A substantial number of credit hours of undergraduate coursework in English beyond the first-year level, or evidence of equivalent academic preparation for graduate study in English, as approved by the department.
- A writing sample of 6-10 pages, which must be an example of analytical, scholarly writing (rather than creative writing) in any area of English studies. Students may submit an excerpt from a longer work with a short prefatory paragraph offering a description or introduction to the selection. Students who have

been out of school for an extended period and do not have a scholarly writing sample should contact the Director of Graduate Studies about an alternative way to meet this requirement.

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The program requires a minimum of 36 credit hours. Students must select a concentration from the following options:

- 1) Applied Linguistics
- 2) Children's Literature
- 3) Composition/Rhetoric
- 4) Creative Writing
- 5) English Education
- 6) English for Specific Purposes
- 7) Literature
- 8) Technical/Professional Writing

For all students except those in the English Education concentration, of the 36 hours of graduate credit, 30 must be in English courses; the remaining 6 credit hours may be taken in English or in another discipline. If the credit hours are to be taken outside of English, students must submit a written request to the Graduate Program Director, explaining how these credit hours will enrich their program. Additionally, at least 18 credit hours must be in English courses at the 6000 level, open only to graduate students.

For students in the English Education concentration, all 36 credit hours must be taken in English or the College of Education. Additionally, at least 18 credit hours must be in English or College of Education courses at the 6000 level, open only to graduate students.

Courses beyond 36 hours of graduate credit may be required to remove deficiencies or to satisfy requirements for graduate licensure, or may be recommended to develop areas of need, to pursue particular interests, or to gain specific experience.

No more than 6 credit hours of ENGL 6890 (Directed Reading), may be applied to the degree without written permission of the Department Chair.

Concentrations

Applied Linguistics Concentration

Linguistics is a broad field, and the applied linguistics concentration offers students the opportunity to apply linguistic concepts to a broad range of endeavors, including the teaching of writing, adult English language instruction, and various types of textual analyses.

Core Courses (6 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)
ENGL 6160 - Introduction to the English Language (3)

Required Courses (9 credit hours)

ENGL 6127 - Seminar in Language, Culture and Society (3)
ENGL 6161 - Introduction to Linguistics (3)
ENGL 6163 - Understanding Language Learning: Mind, Identity, and the Sociocultural World (3)

Elective Linguistics Courses (6 credit hours)

Select two of the following:

ENGL 5075 - Topics in Linguistics (3)
ENGL 5161 - Modern English Grammar (3)
ENGL 5165 - Multiculturalism and Language (3)
ENGL 5166 - Comparative Language Studies for Teachers (3)
ENGL 5167 - The Mind and Language (3)
ENGL 5168 - Multimodality and Text Description (3)
ENGL 5254 - Teaching English/Communications Skills to Middle and Secondary School Learners (3)
ENGL 5260 - History of Global Englishes (3)
ENGL 5262 - Language and Diversity (3)
ENGL 5263 - Linguistics and Language Learning (3)
ENGL 5272 - Studies in the Politics of Language and Writing (3)
ENGL 6162 - History of the English Language (3)
ENGL 6164 - Comparative Language Analysis for Teachers (3)
ENGL 6165 - Introduction to English for Specific Purposes (3)
ENGL 6167 - Research Methods in Applied Linguistics (3)
ENGL 6168 - Practicum in English for Specific Purposes (3)

Elective Literature Courses (6 credit hours)

Select two of the following:

ENGL 5002 - Women and Literature (3)
ENGL 5072 - Topics in Literature and Film (3)
ENGL 5074 - Topics in Children's Literature, Media, and Culture (3)
ENGL 5090 - Major Authors (3)
ENGL 5102 - British Children's Literature (3)
ENGL 5103 - American Children's Literature (3)
ENGL 5104 - Multiculturalism and Children's Literature (3)
ENGL 5114 - Milton (3)
ENGL 5116 - Shakespeare's Early Plays (3)
ENGL 5117 - Shakespeare's Late Plays (3)

ENGL 5121 - The 18th-Century British Novel (3)
ENGL 5122 - The Victorian Novel (3)
ENGL 5123 - The Modern British Novel (3)
ENGL 5124 - Modern Irish Literature (3)
ENGL 5131 - British Drama to 1600, Excluding Shakespeare (3)
ENGL 5132 - British Drama to 1642 (3)
ENGL 5133 - British Drama of Wit and Intrigue, 1660-1780 (3)
ENGL 5143 - The American Novel of the 19th Century (3)
ENGL 5144 - The American Novel of the 20th Century (3)
ENGL 5145 - Literature of the American South (3)
ENGL 5146 - Contemporary Jewish-American Literature (3)
ENGL 5147 - Early Black American Literature (3)
ENGL 5148 - 20th Century Black American Literature: Prose (3)
ENGL 5150 - Contemporary Poetry (3)
ENGL 5151 - Drama (3)
ENGL 5152 - Modern European Literature (3)
ENGL 5153 - Contemporary Fiction (3)
ENGL 5155 - Pan-African Literature (3)
ENGL 5156 - Gender and African American Literature (3)
ENGL 5157 - African American Poetry (3)
ENGL 5207 - Writing Young Adult Fiction (3)
ENGL 5210 - Greek and Roman Drama in Translation (3)
ENGL 5211 - Chaucer (3)
ENGL 5235 - History of the Book (3)
ENGL 5251 - Literary Criticism Through Arnold (3)
ENGL 5252 - Modern Literary Criticism (3)
ENGL 5325 - Trauma and Memory in Contemporary American Literature (3)
ENGL 6072 - Topics in Literature and Film (3)
ENGL 6103 - Introduction to Children's Literature and Culture (3)
ENGL 6104 - Major Figures and Themes in Children's Literature (3)
ENGL 6111 - Shakespeare's Comedies and Histories (3)
ENGL 6112 - Shakespeare's Tragedies (3)
ENGL 6113 - Milton (3)
ENGL 6123 - The Augustan Age, 1660-1785 (3)
ENGL 6125 - The Romantic Era, 1785-1832 (3)
ENGL 6126 - The Victorian Era, 1832-1900 (3)
ENGL 6141 - American Romanticism (3)
ENGL 6142 - American Realism and Naturalism (3)
ENGL 6143 - American Modernism (3)
ENGL 6144 - Stylistics (3)
ENGL 6147 - Perspectives in African American Literature (3)
ENGL 6680 - Seminar in British Literature (3)
ENGL 6685 - Seminar in American Literature (3)
ENGL 6687 - Seminar in Global Literature (3)

Elective Writing/Rhetoric Courses (6 credit hours)

Select two of the following:

ENGL 5008 - Topics in Advanced Technical Communication (3)
ENGL 5077 - Topics in Rhetoric and Composition (3)
ENGL 5078 - Special Topics in Poetry Writing (3)

ENGL 5079 - Special Topics in Fiction Writing (3)
 ENGL 5180 - Theories of Technical Communication (3)
 ENGL 5181 - Writing and Designing User Documents (3)
 ENGL 5182 - Information Design and Digital Publishing (3)
 ENGL 5183 - Editing with Digital Technologies (3)
 ENGL 5200 - Teaching of Writing (3)
 ENGL 5202 - Advanced Poetry Writing (3)
 ENGL 5203 - Advanced Fiction Writing (3)
 ENGL 5204 - Expository Writing (3)
 ENGL 5205 - Advanced Expository Writing (3)
 ENGL 5206 - Advanced Creative Nonfiction Writing (3)
 ENGL 5207 - Writing Young Adult Fiction (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5264 - Literacy in Family and Community (3)
 ENGL 5270 - Studies in Writing, Rhetoric, and Literacy (3)
 ENGL 5271 - Studies in Writing, Rhetoric, and New Media (3)
 ENGL 5274 - Visual Rhetoric (3)
 ENGL 5275 - Rhetoric and Technology (3)
 ENGL 5277 - Digital Literacies (3)
 ENGL 5280 - Writing About Place (3)
 ENGL 5290 - Advanced Creative Project (3)
 ENGL 5400 - Research, Theory, and Practice of Tutoring Writing (3)
 ENGL 6008 - Topics in Advanced Technical Communication (3)
 ENGL 6062 - Topics in Rhetoric (3)
 ENGL 6073 - Topics in Creative Writing (3)
 ENGL 6116 - Technical/Professional Writing (3)
 ENGL 6166 - Rhetorical Theory (3)
 ENGL 6181 - Composition Theory and Pedagogy (3)
 ENGL 6182 - Research Theory and Method in Rhetoric and Composition (3)
 ENGL 6183 - Critical Pedagogy and the Teaching of Writing (3)
 ENGL 6195 - Teaching College English (3)

Project/Thesis (3-6 credit hours)

All students in the Applied Linguistics concentration must submit either a project or a thesis to satisfy requirements for the degree.

Project

Students electing to submit a project to satisfy this requirement enroll in a course leading to the production of a project. Students consult with the English Graduate Program Director for details on the requirements for this project.

ENGL 6895 Project (3)

Master's Thesis

Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers. Since the thesis option carries 6 credit hours, students electing the thesis option

will take only one course from the Elective Linguistics Courses listed above.

ENGL 6996 - Thesis (3 or 6)

or

ENGL 6995 - Thesis Preparation (3)

and ENGL 6996 - Thesis (3 or 6)

Children's Literature Concentration

This concentration is premised on the assumptions that children's literature is an integral part of many literary traditions and that students studying children's literature should develop an understanding of the connection between children's literature and other forms of literature. The Children's Literature Concentration requires a total of 36 credit hours.

Core Courses (6 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)

ENGL 6160 - Introduction to the English Language (3)

Introductory Course (3 credit hours)

ENGL 6103 - Introduction to Children's Literature and Culture (3)

Elective Children's Literature Courses (12 credit hours)

Select four of the following:

ENGL 5074 - Topics in Children's Literature, Media, and Culture (3)

ENGL 5102 - British Children's Literature (3)

ENGL 5103 - American Children's Literature (3)

ENGL 5104 - Multiculturalism and Children's Literature (3)

ENGL 5207 - Writing Young Adult Fiction (3)

ENGL 6104 - Major Figures and Themes in Children's Literature (3)

ENGL 6890 - Directed Reading (3)

ENGL 6996 - Thesis (6)

READ 6100 - Current Issues and Practices in Literacy (3)

Elective Literature Courses (6 credit hours)

Select two of the following literature courses (that aren't children's literature):

ENGL 5002 - Women and Literature (3)

ENGL 5072 - Topics in Literature and Film (3)

ENGL 5090 - Major Authors (3)

ENGL 5114 - Milton (3)

ENGL 5116 - Shakespeare's Early Plays (3)

ENGL 5117 - Shakespeare's Late Plays (3)

ENGL 5121 - The 18th-Century British Novel (3)

ENGL 5122 - The Victorian Novel (3)

ENGL 5123 - The Modern British Novel (3)

ENGL 5124 - Modern Irish Literature (3)

ENGL 5131 - British Drama to 1600, Excluding Shakespeare (3)

ENGL 5132 - British Drama to 1642 (3)

ENGL 5133 - British Drama of Wit and Intrigue, 1660-1780 (3)

ENGL 5143 - The American Novel of the 19th Century (3)
 ENGL 5144 - The American Novel of the 20th Century (3)
 ENGL 5145 - Literature of the American South (3)
 ENGL 5146 - Contemporary Jewish-American Literature (3)
 ENGL 5147 - Early Black American Literature (3)
 ENGL 5148 - 20th Century Black American Literature: Prose (3)
 ENGL 5150 - Contemporary Poetry (3)
 ENGL 5151 - Drama (3)
 ENGL 5152 - Modern European Literature (3)
 ENGL 5153 - Contemporary Fiction (3)
 ENGL 5155 - Pan-African Literature (3)
 ENGL 5156 - Gender and African American Literature (3)
 ENGL 5157 - African American Poetry (3)
 ENGL 5210 - Greek and Roman Drama in Translation (3)
 ENGL 5211 - Chaucer (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5251 - Literary Criticism Through Arnold (3)
 ENGL 5252 - Modern Literary Criticism (3)
 ENGL 5325 - Trauma and Memory in Contemporary American Literature (3)
 ENGL 6072 - Topics in Literature and Film (3)
 ENGL 6111 - Shakespeare's Comedies and Histories (3)
 ENGL 6112 - Shakespeare's Tragedies (3)
 ENGL 6113 - Milton (3)
 ENGL 6123 - The Augustan Age, 1660-1785 (3)
 ENGL 6125 - The Romantic Era, 1785-1832 (3)
 ENGL 6126 - The Victorian Era, 1832-1900 (3)
 ENGL 6141 - American Romanticism (3)
 ENGL 6142 - American Realism and Naturalism (3)
 ENGL 6143 - American Modernism (3)
 ENGL 6144 - Stylistics (3)
 ENGL 6147 - Perspectives in African American Literature (3)
 ENGL 6680 - Seminar in British Literature (3)
 ENGL 6685 - Seminar in American Literature (3)
 ENGL 6687 - Seminar in Global Literature (3)

Elective Writing/Rhetoric Course (3 credit hours)

Select one of the following:

ENGL 5008 - Topics in Advanced Technical Communication (3)
 ENGL 5077 - Topics in Rhetoric and Composition (3)
 ENGL 5078 - Special Topics in Poetry Writing (3)
 ENGL 5079 - Special Topics in Fiction Writing (3)
 ENGL 5180 - Theories of Technical Communication (3)
 ENGL 5181 - Writing and Designing User Documents (3)
 ENGL 5182 - Information Design and Digital Publishing (3)
 ENGL 5183 - Editing with Digital Technologies (3)
 ENGL 5200 - Teaching of Writing (3)
 ENGL 5202 - Advanced Poetry Writing (3)
 ENGL 5203 - Advanced Fiction Writing (3)
 ENGL 5204 - Expository Writing (3)
 ENGL 5205 - Advanced Expository Writing (3)
 ENGL 5206 - Advanced Creative Nonfiction Writing (3)
 ENGL 5207 - Writing Young Adult Fiction (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5264 - Literacy in Family and Community (3)

ENGL 5270 - Studies in Writing, Rhetoric, and Literacy (3)
 ENGL 5271 - Studies in Writing, Rhetoric, and New Media (3)
 ENGL 5274 - Visual Rhetoric (3)
 ENGL 5275 - Rhetoric and Technology (3)
 ENGL 5277 - Digital Literacies (3)
 ENGL 5280 - Writing About Place (3)
 ENGL 5290 - Advanced Creative Project (3)
 ENGL 5400 - Research, Theory, and Practice of Tutoring Writing (3)
 ENGL 6008 - Topics in Advanced Technical Communication (3)
 ENGL 6062 - Topics in Rhetoric (3)
 ENGL 6073 - Topics in Creative Writing (3)
 ENGL 6116 - Technical/Professional Writing (3)
 ENGL 6166 - Rhetorical Theory (3)
 ENGL 6181 - Composition Theory and Pedagogy (3)
 ENGL 6182 - Research Theory and Method in Rhetoric and Composition (3)
 ENGL 6183 - Critical Pedagogy and the Teaching of Writing (3)
 ENGL 6195 - Teaching College English (3)

Portfolio (0 credit hours)/Thesis (0-6 credit hours)

All students in the children's literature concentration must satisfactorily complete either a portfolio or a Master's thesis.

Portfolio

Students electing this option must satisfactorily complete a portfolio of three papers and a critical reflection essay. More information about the portfolio is available in the Department of English office. The portfolio must be submitted in the final semester, and not before 24 hours of coursework have been completed. In their final semester, students who intend to complete a portfolio should consult with the Director of Graduate Studies in English, who will appoint faculty members to serve on the portfolio committee. Copies of the portfolio must be submitted to the committee at least two weeks prior to the last week of classes for the semester.

Master's Thesis

The thesis may be either scholarly or creative. Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers. Students electing the thesis option receive six credit hours that replace the unrestricted elective course and another course as approved by the English Graduate Program Director.

ENGL 6996 Thesis (6)
 or
 ENGL 6995 – Thesis Preparation (3)
 and ENGL 6996 – Thesis (3 or 6)

Unrestricted Elective Courses (0-6 credit hours)

Students who elect the Portfolio option above select two additional elective courses. Students who elect the Thesis option above are not required to take any additional elective courses. Elective courses require approval of the English Graduate Program Director.

Composition/Rhetoric Concentration

The field of rhetoric and composition prepares students comprehensively in the theory, practice, and teaching of written public discourse. The program introduces research in the language arts, from the ancient rhetoric of Greece and Rome to modern theories of the composing process, while also emphasizing practical preparation in the teaching of writing and the administration of composition programs, writing centers, and writing across the curriculum programs. The Composition/Rhetoric concentration may focus on rhetorical theory, composition theory, or writing and pedagogy.

Core Courses (6 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)

ENGL 6160 - Introduction to the English Language (3)

Elective Writing Theory Intensive Course (3 credit hours)

Select one of the following:

ENGL 6166 - Rhetorical Theory (3)

or another course approved by the English Graduate Program Director

Elective Literature Courses (6 credit hours)

Select two of the following:

ENGL 5002 - Women and Literature (3)

ENGL 5072 - Topics in Literature and Film (3)

ENGL 5074 - Topics in Children's Literature, Media, and Culture (3)

ENGL 5090 - Major Authors (3)

ENGL 5102 - British Children's Literature (3)

ENGL 5103 - American Children's Literature (3)

ENGL 5104 - Multiculturalism and Children's Literature (3)

ENGL 5114 - Milton (3)

ENGL 5116 - Shakespeare's Early Plays (3)

ENGL 5117 - Shakespeare's Late Plays (3)

ENGL 5121 - The 18th-Century British Novel (3)

ENGL 5122 - The Victorian Novel (3)

ENGL 5123 - The Modern British Novel (3)

ENGL 5124 - Modern Irish Literature (3)

ENGL 5131 - British Drama to 1600, Excluding Shakespeare (3)

ENGL 5132 - British Drama to 1642 (3)

ENGL 5133 - British Drama of Wit and Intrigue, 1660-1780 (3)

ENGL 5143 - The American Novel of the 19th Century (3)

ENGL 5144 - The American Novel of the 20th Century (3)

ENGL 5145 - Literature of the American South (3)

ENGL 5146 - Contemporary Jewish-American Literature (3)

ENGL 5147 - Early Black American Literature (3)

ENGL 5148 - 20th Century Black American Literature:

Prose (3)

ENGL 5150 - Contemporary Poetry (3)

ENGL 5151 - Drama (3)

ENGL 5152 - Modern European Literature (3)

ENGL 5153 - Contemporary Fiction (3)

ENGL 5155 - Pan-African Literature (3)

ENGL 5156 - Gender and African American Literature (3)

ENGL 5157 - African American Poetry (3)

ENGL 5207 - Writing Young Adult Fiction (3)

ENGL 5210 - Greek and Roman Drama in Translation (3)

ENGL 5211 - Chaucer (3)

ENGL 5235 - History of the Book (3)

ENGL 5251 - Literary Criticism Through Arnold (3)

ENGL 5252 - Modern Literary Criticism (3)

ENGL 5325 - Trauma and Memory in Contemporary American Literature (3)

ENGL 6072 - Topics in Literature and Film (3)

ENGL 6103 - Introduction to Children's Literature and Culture (3)

ENGL 6104 - Major Figures and Themes in Children's Literature (3)

ENGL 6111 - Shakespeare's Comedies and Histories (3)

ENGL 6112 - Shakespeare's Tragedies (3)

ENGL 6113 - Milton (3)

ENGL 6123 - The Augustan Age, 1660-1785 (3)

ENGL 6125 - The Romantic Era, 1785-1832 (3)

ENGL 6126 - The Victorian Era, 1832-1900 (3)

ENGL 6141 - American Romanticism (3)

ENGL 6142 - American Realism and Naturalism (3)

ENGL 6143 - American Modernism (3)

ENGL 6144 - Stylistics (3)

ENGL 6147 - Perspectives in African American Literature (3)

ENGL 6680 - Seminar in British Literature (3)

ENGL 6685 - Seminar in American Literature (3)

ENGL 6687 - Seminar in Global Literature (3)

Elective Composition/Rhetoric Courses (12 credit hours)

Select four of the following:

ENGL 5077 - Topics in Rhetoric and Composition (3)

ENGL 5200 - Teaching of Writing (3)

ENGL 5204 - Expository Writing (3)

ENGL 5205 - Advanced Expository Writing (3)

ENGL 5264 - Literacy in Family and Community (3)

ENGL 5270 - Studies in Writing, Rhetoric, and Literacy (3)

ENGL 5271 - Studies in Writing, Rhetoric, and New Media (3)

ENGL 5272 - Studies in the Politics of Language and Writing (3)

ENGL 5274 - Visual Rhetoric (3)

ENGL 5275 - Rhetoric and Technology (3)

ENGL 5277 - Digital Literacies (3)

ENGL 5400 - Research, Theory, and Practice of Tutoring Writing (3)

ENGL 6062 - Topics in Rhetoric (3)

ENGL 6166 - Rhetorical Theory (3)

ENGL 6181 - Composition Theory and Pedagogy (3)

ENGL 6182 - Research Theory and Method in Rhetoric and Composition (3)
 ENGL 6183 - Critical Pedagogy and the Teaching of Writing (3)
 ENGL 6195 - Teaching College English (3)

Project/Thesis (3-6 credit hours)

All students in the Composition/Rhetoric concentration must submit either a project or a thesis to satisfy requirements for the degree.

Project

Students electing to submit a project to satisfy this requirement enroll in a course leading to the production of a project. Students consult with the English Graduate Program Director for details on the requirements for this project.

ENGL 6895 - Project (3)

Master's Thesis

Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers.

ENGL 6996 - Thesis (6)

or

ENGL 6995 – Thesis Preparation (3)
 and ENGL 6996 – Thesis (3 or 6)

Unrestricted Elective Courses (3-6 credit hours)

Students who elect the Project option above select two additional elective courses. Students who elect the Thesis option above select one additional elective course. Elective courses require approval of the English Graduate Program Director.

Creative Writing Concentration

The aim of this concentration is to enable students to develop their abilities as creative writers through writing practice in more than one genre and through the creatively-engaged study of literature.

Core Courses (6 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)
 ENGL 6160 - Introduction to the English Language (3)

Elective Fiction Writing Course (3 credit hours)

Select one of the following:

ENGL 5079 - Special Topics in Fiction Writing (3)
 ENGL 5203 - Advanced Fiction Writing (3)
 ENGL 5206 - Advanced Creative Nonfiction Writing (3)
 ENGL 5207 - Writing Young Adult Fiction (3)
 ENGL 5280 - Writing About Place (3)

Elective Poetry Writing Course (3 credit hours)

Select one of the following:

ENGL 5078 - Special Topics in Poetry Writing (3)
 ENGL 5202 - Advanced Poetry Writing (3)

Elective Creative Writing Courses (6 credit hours)

ENGL 6073 - Topics in Creative Writing (3)
 ENGL 6073 - Topics in Creative Writing (3)

Elective Literature Courses (9 credit hours)

Select three of the following, one of which must be in modern and/or contemporary literature:

ENGL 5002 - Women and Literature (3)
 ENGL 5072 - Topics in Literature and Film (3)
 ENGL 5074 - Topics in Children's Literature, Media, and Culture (3)
 ENGL 5090 - Major Authors (3)
 ENGL 5102 - British Children's Literature (3)
 ENGL 5103 - American Children's Literature (3)
 ENGL 5104 - Multiculturalism and Children's Literature (3)
 ENGL 5114 - Milton (3)
 ENGL 5116 - Shakespeare's Early Plays (3)
 ENGL 5117 - Shakespeare's Late Plays (3)
 ENGL 5121 - The 18th-Century British Novel (3)
 ENGL 5122 - The Victorian Novel (3)
 ENGL 5123 - The Modern British Novel (3)
 ENGL 5124 - Modern Irish Literature (3)
 ENGL 5131 - British Drama to 1600, Excluding Shakespeare (3)
 ENGL 5132 - British Drama to 1642 (3)
 ENGL 5133 - British Drama of Wit and Intrigue, 1660-1780 (3)
 ENGL 5143 - The American Novel of the 19th Century (3)
 ENGL 5144 - The American Novel of the 20th Century (3)
 ENGL 5145 - Literature of the American South (3)
 ENGL 5146 - Contemporary Jewish-American Literature (3)
 ENGL 5147 - Early Black American Literature (3)
 ENGL 5148 - 20th Century Black American Literature: Prose (3)
 ENGL 5150 - Contemporary Poetry (3)
 ENGL 5151 - Drama (3)
 ENGL 5152 - Modern European Literature (3)
 ENGL 5153 - Contemporary Fiction (3)
 ENGL 5155 - Pan-African Literature (3)
 ENGL 5156 - Gender and African American Literature (3)
 ENGL 5157 - African American Poetry (3)
 ENGL 5207 - Writing Young Adult Fiction (3)
 ENGL 5210 - Greek and Roman Drama in Translation (3)
 ENGL 5211 - Chaucer (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5251 - Literary Criticism Through Arnold (3)
 ENGL 5252 - Modern Literary Criticism (3)
 ENGL 5325 - Trauma and Memory in Contemporary American Literature (3)
 ENGL 6072 - Topics in Literature and Film (3)
 ENGL 6103 - Introduction to Children's Literature and Culture (3)

ENGL 6104 - Major Figures and Themes in Children's Literature (3)
 ENGL 6111 - Shakespeare's Comedies and Histories (3)
 ENGL 6112 - Shakespeare's Tragedies (3)
 ENGL 6113 - Milton (3)
 ENGL 6123 - The Augustan Age, 1660-1785 (3)
 ENGL 6125 - The Romantic Era, 1785-1832 (3)
 ENGL 6126 - The Victorian Era, 1832-1900 (3)
 ENGL 6141 - American Romanticism (3)
 ENGL 6142 - American Realism and Naturalism (3)
 ENGL 6143 - American Modernism (3)
 ENGL 6144 - Stylistics (3)
 ENGL 6147 - Perspectives in African American Literature (3)
 ENGL 6680 - Seminar in British Literature (3)
 ENGL 6685 - Seminar in American Literature (3)
 ENGL 6687 - Seminar in Global Literature (3)

Project/Thesis (3-6 credit hours)

All students in the Creative Writing concentration must submit either a project or a thesis to satisfy requirements for the degree.

Project

Students electing to submit a project to satisfy this requirement enroll in a course leading to the production of a project. Students consult with the English Graduate Program Director for details on the requirements for this project.

ENGL 6895 - Project (3)

Master's Thesis

Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers.

ENGL 6996 Thesis (6)

or

ENGL 6995 – Thesis Preparation (3)
 and ENGL 6996 – Thesis (3 or 6)

Unrestricted Elective Courses (3-6 credit hours)

Students who elect the Project option above select two additional elective courses. Students who elect the Thesis option above select one additional elective course. Elective courses require approval of the English Graduate Program Director.

Elective courses may be additional creative writing courses, if students wish to repeat any of the fiction or poetry courses listed above in order to receive additional instruction in their chosen genre.

English Education Concentration

The Master of Arts in English with a Concentration in English Education has been developed specifically for teachers of the English language arts in middle and secondary schools who desire advanced study in English content and pedagogy, and seek an opportunity to integrate advanced study with their teaching experiences. In addition, candidates acquire the skills, knowledge and abilities required to assume a leadership roles as department chairs, interdisciplinary team leaders, or staff development specialists. Candidates in the program serve as resources for one another and become active members in a community of professionals who are knowledgeable, effective, and committed practitioners. At the conclusion of the program, graduates will be teacher leaders who understand and establish respectful educational environments, demonstrate content and curriculum expertise, effectively support student learning through evidence-based research, and exhibit systematic, critical analysis of learning through purposeful and meaningful reflection.

Program Goals

Successful graduates possess a comprehensive pedagogical, conceptual, and reflective knowledge base that can be applied to their classrooms through effective instruction, responsiveness, and collaboration. Program graduates will be able to:

- Self-direct their personal and professional growth
- Respond effectively to adolescent differences, equity and diversity, and global learning communities
- Demonstrate advanced pedagogical content knowledge of the curriculum, as well as apply 21st knowledge, skills, and technical expertise
- Improve educational practice through critical self-reflection, self-assessment, and applied research
- Work collaboratively with colleagues, professionals, parents, guardians, families and individuals charged with the well-being of learners
- Assume a leadership role at the local, district, regional, state, or national level

Additional Admission Requirements

In addition to the general requirements for admission to the Graduate School, applicants must:

- Hold the "A" license in Secondary English or Middle Grades Language Arts from the North Carolina Department of Public Instruction (or its equivalent from another state)
- Have an undergraduate GPA of 2.75 overall and 3.0 in the Junior/Senior years and 30 credit hours of undergraduate coursework in English beyond the Freshman level, or evidence of equivalent academic preparation

Core Course (3 credit hours)*Select one of the following:*

ENGL 6101 - Introduction to Literary Studies (3)

ENGL 6160 - Introduction to the English Language (3)

English Specialization Requirements (12 credit hours)

Select 12 credit hours of graduate-level ENGL courses selected in consultation with the Graduate Program Director. The program's 12 credit hours of content specialization courses are not free electives, but a planned program of study identified upon the student's enrollment in the program as part of the student's overall professional and program plan. At least 18 credit hours of coursework in the program must be in Department of English or College of Education courses at the 6000 level.

Professional Requirements (12 credit hours)***Required Professional Courses***

EDUC 5100 - Diverse Learners (3)

ENGL 6274 - Contexts and Issues in the Teaching of English (3)

or EDUC 6274 - Contexts and Issues in the Teaching of English (3)

MDSK 6260 - Teacher Leadership (3)

Elective Professional Course

For the final three credit hours, select a graduate-level ENGL, MDSK, or EDUC course in consultation with the Graduate Program Director. The program's professional courses are not free electives, but a planned program of study identified upon the student's enrollment in the program as part of the student's overall professional and program plan.

Research Requirements (6 credit hours)***Required Research Course****Select one of the following:*

ENGL 6674 - Applied Research Methods in the Teaching of English (3)

RSCH 7111 - Qualitative Research Methods (3)

Or another research course approved by the English Graduate Program Director

Elective Research Course

Select 3 credit hours of a graduate-level ENGL, MDSK, or EDUC course in consultation with the Graduate Program Director.

Project/Thesis (3-6 credit hours)

All students in the English Education concentration must submit either a project or a thesis to satisfy requirements for the degree.

Project

Students electing to submit a project to satisfy this requirement enroll in a course leading to the production of a project. Students consult with the English Graduate

Program Director for details on the requirements for this project.

ENGL 6895 - Project (3)

Master's Thesis

Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers. Since the thesis option carries 6 credit hours, students electing the thesis option will take only ENGL 6674, not the additional Research Requirements course.

ENGL 6996 - Thesis (6)

or

ENGL 6995 - Thesis Preparation (3)

and ENGL 6996 - Thesis (3 or 6)

Licensure

The M.A. in English with a Concentration in English Education qualifies graduates for the Master's/Advanced Competencies "M" license in English Education.

Program Certifications/Accreditation

The program is accredited by both NCATE and NCDPI.

English for Specific Purposes Concentration

With this concentration, certified English for Specific Purposes (ESP) teachers are prepared to teach adult learners in community colleges, in in-company training courses, and in English language institutes at the university level, both in the U.S. and internationally.

Core Courses (6 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)

ENGL 6160 - Introduction to the English Language (3)

Required Courses (9 credit hours)

ENGL 6165 - Introduction to English for Specific Purposes (3)

ENGL 6168 - Practicum in English for Specific Purposes (3)

ENGL 6167 - Research Methods in Applied Linguistics (3)

or RSCH 6101 - Research Methods (3)

or RSCH 7111 - Qualitative Research Methods (3)

or another research course approved by the English Graduate Program Director

Elective Courses (12 credit hours)*Select four of the following:*

ENGL 5075 - Topics in Linguistics (3)

ENGL 5161 - Modern English Grammar (3)

ENGL 5165 - Multiculturalism and Language (3)

ENGL 5166 - Comparative Language Studies for Teachers (3)

ENGL 5167 - The Mind and Language (3)

ENGL 5168 - Multimodality and Text Description (3)

ENGL 5260 - History of Global Englishes (3)

ENGL 5262 - Language and Diversity (3)
 ENGL 5263 - Linguistics and Language Learning (3)
 ENGL 5272 - Studies in the Politics of Language and Writing (3)
 ENGL 6127 - Seminar in Language, Culture, and Society (3)
 ENGL 6161 - Introduction to Linguistics (3)
 ENGL 6162 - History of the English Language (3)
 ENGL 6163 - Understanding Language Learning: Mind, Identity, and the Sociocultural World (3)
 ENGL 6164 - Comparative Language Analysis for Teachers (3)

Project/Thesis (3-6 credit hours)

All students in the English for Specific Purposes concentration must submit either a project or a thesis to satisfy requirements for the degree.

Project

Students electing to submit a project to satisfy this requirement enroll in a course leading to the production of a project. Students consult with the English Graduate Program Director for details on the requirements for this project.

ENGL 6895 - Project (3)

Master's Thesis

Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers.

ENGL 6996 Thesis (6)

or

ENGL 6995 – Thesis Preparation (3)
 and ENGL 6996 – Thesis (3 or 6)

Unrestricted Elective Courses (3-6 credit hours)

Students who elect the Project option above select two additional elective courses. Students who elect the Thesis option above select one additional elective course. Elective courses require approval of the English Graduate Program Director.

Literature Concentration

The literature faculty are committed to teaching a variety of national and ethnic literatures in English, including British, American, and Anglophone literatures. The Literature concentration requires a total of 36 credit hours.

Core Courses (6 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)
 ENGL 6160 - Introduction to the English Language (3)

Elective Literature Courses (15 credit hours)

Select five of the following, of which three must be historically oriented, three must be in at least two national

literatures (American, British, global), and one must be in literature written before 1800:

ENGL 5002 - Women and Literature (3)
 ENGL 5072 - Topics in Literature and Film (3)
 ENGL 5074 - Topics in Children's Literature, Media, and Culture (3)
 ENGL 5090 - Major Authors (3)
 ENGL 5102 - British Children's Literature (3)
 ENGL 5103 - American Children's Literature (3)
 ENGL 5104 - Multiculturalism and Children's Literature (3)
 ENGL 5114 - Milton (3)
 ENGL 5116 - Shakespeare's Early Plays (3)
 ENGL 5117 - Shakespeare's Late Plays (3)
 ENGL 5121 - The 18th-Century British Novel (3)
 ENGL 5122 - The Victorian Novel (3)
 ENGL 5123 - The Modern British Novel (3)
 ENGL 5124 - Modern Irish Literature (3)
 ENGL 5131 - British Drama to 1600, Excluding Shakespeare (3)
 ENGL 5132 - British Drama to 1642 (3)
 ENGL 5133 - British Drama of Wit and Intrigue, 1660-1780 (3)
 ENGL 5143 - The American Novel of the 19th Century (3)
 ENGL 5144 - The American Novel of the 20th Century (3)
 ENGL 5145 - Literature of the American South (3)
 ENGL 5146 - Contemporary Jewish-American Literature (3)
 ENGL 5147 - Early Black American Literature (3)
 ENGL 5148 - 20th Century Black American Literature: Prose (3)
 ENGL 5150 - Contemporary Poetry (3)
 ENGL 5151 - Drama (3)
 ENGL 5152 - Modern European Literature (3)
 ENGL 5153 - Contemporary Fiction (3)
 ENGL 5155 - Pan-African Literature (3)
 ENGL 5156 - Gender and African American Literature (3)
 ENGL 5157 - African American Poetry (3)
 ENGL 5207 - Writing Young Adult Fiction (3)
 ENGL 5210 - Greek and Roman Drama in Translation (3)
 ENGL 5211 - Chaucer (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5251 - Literary Criticism Through Arnold (3)
 ENGL 5252 - Modern Literary Criticism (3)
 ENGL 5325 - Trauma and Memory in Contemporary American Literature (3)
 ENGL 6072 - Topics in Literature and Film (3)
 ENGL 6103 - Introduction to Children's Literature and Culture (3)
 ENGL 6104 - Major Figures and Themes in Children's Literature (3)
 ENGL 6111 - Shakespeare's Comedies and Histories (3)
 ENGL 6112 - Shakespeare's Tragedies (3)
 ENGL 6113 - Milton (3)
 ENGL 6123 - The Augustan Age, 1660-1785 (3)
 ENGL 6125 - The Romantic Era, 1785-1832 (3)
 ENGL 6126 - The Victorian Era, 1832-1900 (3)
 ENGL 6141 - American Romanticism (3)

ENGL 6142 - American Realism and Naturalism (3)
 ENGL 6143 - American Modernism (3)
 ENGL 6144 - Stylistics (3)
 ENGL 6147 - Perspectives in African American Literature (3)
 ENGL 6680 - Seminar in British Literature (3)
 ENGL 6685 - Seminar in American Literature (3)
 ENGL 6687 - Seminar in Global Literature (3)

Elective Literary Theory Intensive Course (3 credit hours)

Select one literary theory intensive course.

Elective Writing/Rhetoric Course (3 credit hours)

Select one of the following:

ENGL 5008 - Topics in Advanced Technical Communication (3)
 ENGL 5077 - Topics in Rhetoric and Composition (3)
 ENGL 5078 - Special Topics in Poetry Writing (3)
 ENGL 5079 - Special Topics in Fiction Writing (3)
 ENGL 5180 - Theories of Technical Communication (3)
 ENGL 5181 - Writing and Designing User Documents (3)
 ENGL 5182 - Information Design and Digital Publishing (3)
 ENGL 5183 - Editing with Digital Technologies (3)
 ENGL 5200 - Teaching of Writing (3)
 ENGL 5202 - Advanced Poetry Writing (3)
 ENGL 5203 - Advanced Fiction Writing (3)
 ENGL 5204 - Expository Writing (3)
 ENGL 5205 - Advanced Expository Writing (3)
 ENGL 5206 - Advanced Creative Nonfiction Writing (3)
 ENGL 5207 - Writing Young Adult Fiction (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5264 - Literacy in Family and Community (3)
 ENGL 5271 - Studies in Writing, Rhetoric, and New Media (3)
 ENGL 5274 - Visual Rhetoric (3)
 ENGL 5275 - Rhetoric and Technology (3)
 ENGL 5277 - Digital Literacies (3)
 ENGL 5280 - Writing About Place (3)
 ENGL 5290 - Advanced Creative Project (3)
 ENGL 5400 - Research, Theory, and Practice of Tutoring Writing (3)
 ENGL 6008 - Topics in Advanced Technical Communication (3)
 ENGL 6062 - Topics in Rhetoric (3)
 ENGL 6073 - Topics in Creative Writing (3)
 ENGL 6116 - Technical/Professional Writing (3)
 ENGL 6166 - Rhetorical Theory (3)
 ENGL 6181 - Composition Theory and Pedagogy (3)
 ENGL 6182 - Research Theory and Method in Rhetoric and Composition (3)
 ENGL 6183 - Critical Pedagogy and the Teaching of Writing (3)
 ENGL 6195 - Teaching College English (3)

Portfolio

All students in the literature concentration must satisfactorily complete a portfolio comprised of three papers and a critical reflective essay. More information

about the portfolio is available in the department office. The portfolio may not be attempted sooner than the last semester of coursework, exclusive of thesis credits, and not before 24 hours of coursework have been completed.

Master's Thesis

The thesis is optional for the Literature concentration. Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers.

ENGL 6996 Thesis (6)

or

ENGL 6995 – Thesis Preparation (3)
 and ENGL 6996 – Thesis (3 or 6)

Unrestricted Elective Courses (3-9 credit hours)

Students who elect the Thesis option above are required to take one additional elective course. Students who do not elect the Thesis option are required to take three additional elective courses. Elective courses require approval of the English Graduate Program Director.

Technical/Professional Writing Concentration

This concentration includes courses that: 1) provide students with an understanding of the theoretical and rhetorical foundation of the field, 2) introduce students to the methods and results of research in the field, 3) offer students an opportunity to practice theory and research through project work for clients, 4) address technology and science as socially constructed disciplines, and 5) help students build skills in written and oral communication, project management, and teamwork.

Core Courses (6 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)
 ENGL 6160 - Introduction to the English Language (3)

Required Courses (9 credit hours)

ENGL 5181 - Writing and Designing User Documents (3)
 ENGL 6116 - Technical/Professional Writing (3) (*this course should be taken in the first year*)
 ENGL 6166 - Rhetorical Theory (3)

Elective Technical Communication Courses (9 credit hours)

Select three of the following:

ENGL 5008 - Topics in Advanced Technical Communication (3) (*may be repeated for credit*)
 ENGL 5180 - Theories of Technical Communication (3)
 ENGL 5182 - Information Design and Digital Publishing (3)
 ENGL 5183 - Editing with Digital Technologies (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5271 - Studies in Writing, Rhetoric, and New Media (3)
 ENGL 5274 - Visual Rhetoric (3)
 ENGL 5275 - Rhetoric and Technology (3)

ENGL 5280 - Writing About Place (3)
 ENGL 5410 - Professional Internship (3 or 6)
 ENGL 6008 - Topics in Advanced Technical
 Communication (3) (*may be repeated for credit*)

Project/Thesis (3-6 credit hours)

All students in the Technical/Professional Writing concentration must submit either a project or a thesis to satisfy requirements for the degree.

Project

Students electing to submit a project to satisfy this requirement enroll in a course leading to the production of a project. Students consult with the English Graduate Program Director for details on the requirements for this project.

ENGL 6895 - Project (3)

Master's Thesis

Students consult with the English Graduate Program Director, who will appoint a thesis committee comprising a director and two faculty readers.

ENGL 6996 Thesis (6)
 or
 ENGL 6995 – Thesis Preparation (3)
 and ENGL 6996 – Thesis (3 or 6)

Unrestricted Elective Courses (6-9 credit hours)

Students who elect the Project option above select three additional elective courses. Students who elect the Thesis option above select two additional elective courses. Elective courses require approval of the English Graduate Program Director.

Degree Total = 36 Credit Hours

Grade Requirements

All courses counted toward the degree must be taken with grades of A or B received. A course in which a graduate student receives a grade of C is not allowable as part of the 36 required credit hours.

Advising

The English Graduate Program Director and other graduate faculty members acting as their designated assistants advise graduate students.

Assistantships

A number of graduate assistantships are available each year. Applications must be submitted by March 1 for assistantships beginning the following academic year. Further information is available in the Department of English.

Internships

The Department of English offers a number of internships for graduate students (limited to 3 hours of credit), which provide program-related experience in local television and radio stations, nonprofit and government agencies, and local businesses and corporations. Further information is available in the department.

ENGL 5410 - Professional Internship (3 or 6)

Licensure

For information on licensure in English, please see the requirements of the English Education concentration.

M.A. in English/M.F.A. in Creative Writing

The Department of English, in partnership with Kingston University London (KUL), offers a dual degree program in which a student may earn an M.A. in English with a Concentration in Creative Writing from UNC Charlotte and an M.F.A. in Creative Writing from KUL. The program aims to enable students to develop as creative writers through practice in more than one genre and through the creatively engaged study of literature, as well as to prepare students for professional advancement in fields such as writing, editing, publishing, or teaching on the secondary or college levels.

Admission Requirements

Students must have a B.A. in English or substantial coursework in English courses; some creative writing courses are desirable but not required.

Applications must be submitted online through the Graduate School at gradadmissions.charlotte.edu/apply by February 1. Materials to include:

- Application and fee
- Transcripts from all postsecondary institutions attended
- Three academic letters of recommendation (preferably from instructors who can address the student's writing achievements and potential)
- Statement of purpose (750 words maximum) tailored to the dual degree program, addressing whether the student is applying in poetry or fiction, their interests in writing and ambitions, their background and reasons for applying for this program, and how they are suited to handle an intensive program with an accelerated pace

- Creative writing sample (in PDF format) demonstrating highest quality recent work (for details, see the Department of English website at english.charlotte.edu/graduate-program-information/mamfa-dual-degree-program)

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required.

Please note that students admitted to the UNC Charlotte M.A. program are conditionally admitted to the KU M.F.A. provided the student meets all UNC Charlotte requirements during the first year. They must perform satisfactorily, and complete all 24 credit hours, at UNC Charlotte before continuing on to KU to complete the M.F.A. requirements. This is a full-time residency program; part-time status or online courses are not options. Fall admission only.

Degree Requirements

This is a 36 credit hour program in which students earn 24 credit hours at UNC Charlotte in their first year, and spend one year at Kingston University London (KUL) to earn the additional 12 credit hours required for the M.A. Students take additional modules at KUL to meet the requirements for the M.F.A. This program requires a thesis to be written while at KUL that also satisfies the research portion of the UNC Charlotte degree.

UNC Charlotte Courses (24 credit hours)

Students spend their first academic year at UNC Charlotte and take the following:

Core Course (3 credit hours)

ENGL 6101 - Introduction to Literary Studies (3)

Elective Fiction Writing Course (3 credit hours)

Select one of the following:

ENGL 5078 - Special Topics in Poetry Writing (3)
 ENGL 5079 - Special Topics in Fiction Writing (3)
 ENGL 5203 - Advanced Fiction Writing (3)
 ENGL 5206 - Advanced Creative Nonfiction Writing (3)
 ENGL 5207 - Writing Young Adult Fiction (3)
 ENGL 5280 - Writing About Place (3)

Elective Poetry Writing Course (3 credit hours)

Select one of the following:

ENGL 5078 - Special Topics in Poetry Writing (3)
 ENGL 5202 - Advanced Poetry Writing (3)

Elective Creative Writing Courses (6 credit hours)

ENGL 6073 - Topics in Creative Writing (3)
 ENGL 6073 - Topics in Creative Writing (3)

Elective Literature Courses (6 credit hours)

Select two of the following, one of which must be in modern and/or contemporary literature:

ENGL 5002 - Women and Literature (3)
 ENGL 5072 - Topics in Literature and Film (3)
 ENGL 5074 - Topics in Children's Literature, Media, and Culture (3)
 ENGL 5090 - Major Authors (3)
 ENGL 5102 - British Children's Literature (3)
 ENGL 5103 - American Children's Literature (3)
 ENGL 5104 - Multiculturalism and Children's Literature (3)
 ENGL 5114 - Milton (3)
 ENGL 5116 - Shakespeare's Early Plays (3)
 ENGL 5117 - Shakespeare's Late Plays (3)
 ENGL 5121 - The 18th-Century British Novel (3)
 ENGL 5122 - The Victorian Novel (3)
 ENGL 5123 - The Modern British Novel (3)
 ENGL 5124 - Modern Irish Literature (3)
 ENGL 5131 - British Drama to 1600, Excluding Shakespeare (3)
 ENGL 5132 - British Drama to 1642 (3)
 ENGL 5133 - British Drama of Wit and Intrigue, 1660-1780 (3)
 ENGL 5143 - The American Novel of the 19th Century (3)
 ENGL 5144 - The American Novel of the 20th Century (3)
 ENGL 5145 - Literature of the American South (3)
 ENGL 5146 - Contemporary Jewish-American Literature (3)
 ENGL 5147 - Early Black American Literature (3)
 ENGL 5148 - 20th Century Black American Literature: Prose (3)
 ENGL 5150 - Contemporary Poetry (3)
 ENGL 5151 - Drama (3)
 ENGL 5152 - Modern European Literature (3)
 ENGL 5153 - Contemporary Fiction (3)
 ENGL 5155 - Pan-African Literature (3)
 ENGL 5156 - Gender and African American Literature (3)
 ENGL 5157 - African American Poetry (3)
 ENGL 5210 - Greek and Roman Drama in Translation (3)
 ENGL 5211 - Chaucer (3)
 ENGL 5325 - Trauma and Memory in Contemporary American Literature (3)
 ENGL 6072 - Topics in Literature and Film (3)
 ENGL 6103 - Introduction to Children's Literature and Culture (3)
 ENGL 6104 - Major Figures and Themes in Children's Literature (3)
 ENGL 6111 - Shakespeare's Comedies and Histories (3)
 ENGL 6112 - Shakespeare's Tragedies (3)
 ENGL 6113 - Milton (3)
 ENGL 6123 - The Augustan Age, 1660-1785 (3)
 ENGL 6125 - The Romantic Era, 1785-1832 (3)
 ENGL 6126 - The Victorian Era, 1832-1900 (3)
 ENGL 6141 - American Romanticism (3)
 ENGL 6142 - American Realism and Naturalism (3)
 ENGL 6143 - American Modernism (3)
 ENGL 6147 - Perspectives in African American Literature (3)
 ENGL 6680 - Seminar in British Literature (3)
 ENGL 6685 - Seminar in American Literature (3)
 ENGL 6687 - Seminar in Global Literature (3)

Unrestricted Elective Course (3 credit hours)

Select any graduate ENGL course:

ENGL 5XXX - English Elective Course (3)

ENGL 6XXX - English Elective Course (3)

KUL Courses (12 credit hours)

In the second year of the program at KUL, students take the following modules:

- Advanced writers workshop
- Teaching creative writing
- Reading for writers
- Visiting speakers
- Research presentations
- Advanced dissertation project

12 credit hours of thesis taken at KUL is applied to the UNC Charlotte M.A. in English as M.A. project hours (ENGL 6895). In both semesters of the second year, students also register for the following UNC Charlotte placeholder course (no credit hours, no fees):

ENGL 6777 - UNCC-ENGLMFA (0)

Students in good standing who are unable to proceed to KUL in their second year may opt to continue in the M.A. in English at UNC Charlotte.

Dual Degree Total = 36 Credit Hours**Grade Requirements**

All courses counted toward the degree must be taken with grades of A or B received. A course in which a graduate student receives a grade of C is not allowable as part of the 36 required credit hours. Students earning C grades in their first year will be ineligible for the KUL M.F.A. but may opt to continue in the M.A. in English at UNC Charlotte.

Graduate Certificate in Applied Linguistics

The Graduate Certificate in Applied Linguistics enables professionals to focus and solidify or update their work with language teaching, with applications in the language industry, or with research. The coursework leading to this certificate grounds the participants in theory and practice, providing linguistic expertise to anyone with related degrees and professional aspirations, and helping to prepare students for work in diverse professions, including:

- Intelligence gathering
- Human-machine interfaces (improving text-to-speech, speech recognition, and integrating language processing and real-world knowledge)

- Profiling
- Data mining
- Therapy
- Standardization of industrial terminology
- Localization of international products for a specific market or culture
- Forensics
- Translation/interpreting

Even in jobs that are not primarily language-oriented, this certificate can help students develop important market skills:

- Increased pragmatic awareness – the skill of recognizing how language works in social contexts, including how different cultures handle verbal behaviors such as requests, negotiations, conventions of politeness, and persuasion.
- Application – the ability to make the connection between theoretical knowledge and putting it to effective use, such as understanding how social power imposes specific constraints on grammar, word choice, and pronunciation.
- Clarity – the mastery of tailoring a message e towards a specific audience with maximum impact, including subliminal techniques (e.g. in advertising).
- Pattern extraction – the knowledge of how to identify and find specific patterns in very large bodies of data.
- Explication – understanding the difference between inductive modeling and deductive hypothesis forming, and the interplay between them.

This certificate is good for students interested in how people are swayed by framing a narrative one way or another, how to prepare materials for adult learners of language, how speech is produced, or how it is learned. It is also a good complement to several master's degree programs at UNC Charlotte such as psychology, computer science, or anthropology.

Admission Requirements

- Statement of purpose
- Three letters of recommendation (preferably from professors)
- Writing sample
- GPA 2.75 or higher

Transfer credits are not accepted in this certificate program.

Certificate Requirements

The Graduate Certificate in Linguistics requires 15 credit hours in approved courses, including a minimum of 6 credit hours at the 6000-level. All coursework must be completed within five years from the time of first

enrollment in a certificate course.

Students can orient their program towards either applied linguistics or the study of second-language research. Appropriate substitutions from other graduate programs on campus (i.e., not transfer credits) can be authorized by the Graduate Program Director of Applied Linguistics in the Department of English (if different) and by the director of the M.A. emphasis in Applied Linguistics. They will also act as advisors to those enrolled in this certificate program.

Students seeking licensure for the teaching of English at levels K-12 should consult the College of Education.

Required Courses (15 credit hours)

Select five of the following; 6 credit hours must be at the 6000 level.

- ENGL 5161 - Modern English Grammar (3)
- ENGL 5165 - Multiculturalism and Language (3)
- ENGL 5166 - Comparative Language Studies for Teachers (3)
- ENGL 5167 - The Mind and Language (3)
- ENGL 5260 - History of the English Language (3)
- ENGL 5262 - Language and Diversity (3)
- ENGL 5263 - Linguistics and Language Learning (3)
or ENGL 6163 - Understanding Language Learning: Mind, Identity, and the Sociocultural World (3)
- ENGL 5272 - Studies in the Politics of Language and Writing (3)
- ENGL 6070 - Topics in English (3) (*if subject is linguistics*)
- ENGL 6127 - Seminar in Language, Culture, and Society (3)
- ENGL 6161 - Introduction to Linguistics (3)
- ENGL 6162 - History of the English Language (3)
- ENGL 6164 - Comparative Language Analysis for Teachers (3)
- ENGL 6165 - Introduction to English for Specific Purposes (3)
- ENGL 6167 - Research Methods in Applied Linguistics (3)
- ENGL 6168 - Practicum in English for Specific Purposes (3)
- ENGL 6195 - Teaching College English (3)

Certificate Total = 15 Credit Hours

Grade Requirements

Students must earn a B or above in all courses presented to the certificate.

Graduate Certificate in Technical/Professional Writing

The Graduate Certificate in Technical/Professional Writing prepares students for careers that combine strong communication skills with technical expertise. Students explore the relationships among language, writing, and computing technologies. This program is specifically designed to prepare students for the challenges

encountered in today's rapidly changing, technologically global society.

With a Technical/Professional Writing background students find careers in:

- computing-related industries, software and hardware
- engineering communication
- environmental communication
- government
- medicine
- other scientific or technical fields

As a technical writer, students are called upon to research, write, test, design or edit technical information for a variety of audiences, including:

- software and hardware documentation
- grants and proposals
- electronic multi-media presentations
- websites
- training materials

In addition to strong communication skills, technical writers must know a variety of computer applications, including word processing, web design software, page layout applications, online help authoring software, and hypertext mark-up language (HTML).

Admission Requirements

Students must apply for admission to the Graduate School and must have a minimum undergraduate GPA of 2.75. Applicants will be required to submit: 1) a current GRE score; 2) a current MAT score; or 3) a portfolio of professional-level documents. Only graduate courses taken at UNC Charlotte will count towards this Graduate Certificate.

Certificate Requirements

The Graduate Certificate in Technical/Professional Writing is designed for post-baccalaureate, graduate, and post-graduate students. Students can complete the required 15 graduate credit hours in approximately 1-2 years.

Required Core Courses (9 credit hours)

- ENGL 5181 - Writing and Designing User Documents (3)
- ENGL 6116 - Technical/Professional Writing (3)
- ENGL 5410 - Professional Internship (3)
or ENGL 6895 - Project (3)

Elective Courses (6 credit hours)

Select two of the following:

- ENGL 5008 - Topics in Advanced Technical Communication (3)
- ENGL 5180 - Theories of Technical Communication (3)
- ENGL 5182 - Information Design and Digital Publishing (3)

ENGL 5183 - Editing with Digital Technologies (3)
 ENGL 5235 - History of the Book (3)
 ENGL 5271 - Studies in Writing, Rhetoric, and New Media
 (3)
 ENGL 5274 - Visual Rhetoric (3)
 ENGL 5275 - Rhetoric and Technology (3)
 ENGL 5280 - Writing About Place (3)
 ENGL 6008 - Topics in Advanced Technical
 Communication (3)
 Other Courses (*as appropriate and approved by the
 Department of English*)

Certificate Total = 15 Credit Hours

ETHICS AND APPLIED PHILOSOPHY

- M.A. in Ethics and Applied Philosophy
- Graduate Certificate in Applied Ethics

Department of Philosophy
philosophy.charlotte.edu

M.A. in Ethics and Applied Philosophy

The M.A. in Ethics and Applied Philosophy degree program is designed to foster the application of ethical and philosophical knowledge to currently pressing concerns in social, economic, medical, technological, legal, commercial, cultural, and political contexts and associations. The department offers both theoretical and applied courses. These courses provide students with a comprehensive, normative, politically-informed and logically consistent training relevant to current challenges encountered in business, data science, medicine, education, and policy-making. The Concentration in Research and Data Ethics includes the typical requirements for the M.A. Degree, with the addition of required and recommended courses designed to give students particular expertise in ethical issues arising in research and data science.

Admission Requirements

In addition to meeting the University's graduate admission requirements, all prospective students must submit:

- A personal statement outlining why the applicant seeks admission to the program
- A philosophical writing sample, preferably addressing an ethical or other philosophical issue, uploaded within the online application system
- Three academic letters of recommendation (to be uploaded by the Recommenders), attached to the recommendation forms required by the Graduate School, which address the student's philosophical skills and/or ethical reasoning ability

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog*

for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Master of Arts in Ethics and Applied Philosophy requires the completion of a minimum of 30 credit hours of approved graduate coursework. The successful completion of the Master’s Research Paper course is also required for the Master of Arts. Prior to starting a Master’s Research Paper course, students in the M.A. program must apply for readmission if they have not taken any courses for two years. All degree requirements must be completed within seven calendar years of first enrollment in the program.

Up to 6 credit hours earned from a college or university accredited by an accepted accrediting body may be eligible for transfer credit. Formal approval must be obtained from the Graduate Program Director and the Dean of the Graduate School.

Most elective courses are Topics courses. Visit philosophy.charlotte.edu/graduate/courses/recent-offerings for details about recent offerings.

Required Courses (6 credit hours)

PHIL 6110 - Ethical Theory (3)
PHIL 6120 - Philosophical Methods and Analysis (3)

Elective Courses (15 credit hours if enrolled in the Research and Data Ethics concentration; otherwise 21 credit hours)

Select from the following:

PHIL 5009 - Major Figure in Philosophy (3)
PHIL 5050 - Topics in Philosophy (1 to 3)
PHIL 5170 - Queer Theory (3)
PHIL 5180 - Feminist Methods (3)
PHIL 5190 - Indigenous Feminisms (3)
PHIL 5220 - Data Ethics (3)
PHIL 5230 - After Auschwitz (3)
PHIL 6050 - Topics in Philosophy (1 to 3)
PHIL 6130 - Ethics, Security, Privacy, and Governance of Data for Social Good (3)
PHIL 6220 - Health Law and Ethics (3)
PHIL 6240 - Research Ethics in the Biological and Behavioral Sciences (3)
PHIL 6250 - Ethics of Public Policy (3)
PHIL 6260 - Ethics and International Affairs (3)
PHIL 6300 - Latin American and Caribbean Thought (3)
PHIL 6330 - Race and Philosophy (3)
PHIL 6410 - Internship in Ethics and Applied Philosophy (3)
PHIL 6602 - Theoretical Approaches to Gender (3)
PHIL 6627 - Feminist Theory and Its Applications (3)
PHIL 6800 - Independent Study (1 to 3)

Capstone Course (3 credit hours)

This course is offered annually and may be repeated for credit with new material.

PHIL 6999 - Master's Research Paper (3)

Research and Data Ethics Concentration

The Concentration in Research and Data Ethics is designed to help prepare students for work in areas such as human and animal subject protection, ethics and compliance, conflicts of interest, and ethical controversies related to AI algorithms and data analytics.

In addition to the required core courses, the Concentration requires Research Ethics in the Biological and Behavioral Science (PHIL 6240) and at least one of Data Ethics (PHIL 5220) and Ethics, Security, Privacy, & Governance of Data for Social Good (PHIL 6130). The remaining courses are electives, but we strongly recommend the following electives:

PHIL 6220 - Health Law and Ethics (3)
PHIL 6250 - Ethics of Public Policy (3)
PHIL 6410 - Internship in Ethics and Applied Philosophy (3)

Required Concentration Courses (6 credit hours)

PHIL 5220 - Data Ethics (3)
PHIL 6130 - Ethics, Security, Privacy, and Governance of Data for Social Good (3)
PHIL 6240 - Research Ethics in the Biological and Behavioral Sciences (3)

Degree Total = 30 Credit Hours

Grade Requirements

All coursework must be completed with a GPA of 3.0 or above.

Advising

The Graduate Program Director serves as formal advisor to graduate students.

Language Requirement

Although students are not required to demonstrate proficiency in a foreign language as a formal requirement of the program, they are expected to acquire competency in and use whatever languages they need to pursue their research interests.

Application for Degree

Graduation information, including deadlines for candidacy and degree application, are available online from the Graduate School at graduateschool.charlotte.edu/current-students/graduation-clearance.

Graduate Certificate in Applied Ethics

The Graduate Certificate in Applied Ethics is of interest to three groups of students: (1) professionals working in areas of applied ethics; (2) students just beginning to explore graduate work in philosophy; and (3) students in other master's and doctoral programs, such as biology, health administration, data or business analytics, and public policy, who expect their careers to include work in applied ethics.

Admission Requirements

In addition to meeting the University's graduate admission requirements, all prospective students must:

- Submit a personal statement outlining why the applicant seeks admission to the program
- Submit two academic letters of recommendation, in addition to the recommendation forms required by the graduate school, which address the student's philosophical skills and/or ethical reasoning
- Hold a bachelor's degree from a college or university accredited by an accepted accrediting body
- Have earned a minimum undergraduate GPA of 2.75

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Certificate Requirements

The Graduate Certificate in Applied Ethics requires the completion of 15 credit hours of graduate coursework in philosophy. Most elective courses are Topics courses. Visit philosophy.charlotte.edu/graduate/courses/recent-offerings for details about recent offerings.

Required Course (3 credit hours)

PHIL 6110 - Ethical Theory (3)

Elective Courses (12 credit hours)

Select from:

PHIL 5050 - Topics in Philosophy (1 to 3)
 PHIL 5170 - Queer Theory (3)
 PHIL 5180 - Feminist Methods (3)
 PHIL 5190 - Indigenous Feminisms (3)
 PHIL 5220 - Data Ethics (3)
 PHIL 5230 - After Auschwitz (3)
 PHIL 6050 - Topics in Philosophy (1 to 3)
 PHIL 6120 - Philosophical Methods and Analysis (3)
 PHIL 6130 - Ethics, Security, Privacy, and Governance of Data for Social Good (3)
 PHIL 6220 - Health Law and Ethics (3)
 PHIL 6240 - Research Ethics in the Biological and Behavioral Sciences (3)

PHIL 6250 - Ethics of Public Policy (3)

PHIL 6260 - Ethics and International Affairs (3)

PHIL 6300 - Latin American and Caribbean Thought (3)

PHIL 6330 - Race and Philosophy (3)

PHIL 6410 - Internship in Ethics and Applied Philosophy (3)

PHIL 6602 - Theoretical Approaches to Gender (3)

PHIL 6627 - Feminist Theory and Its Applications (3)

PHIL 6800 - Independent Study (1 to 3)

Approval of the Department of Philosophy Graduate Program Director is required in order to substitute related courses offered by other departments and programs.

Certificate Total = 15 Credit Hours

Advising

The Graduate Program Director serves as formal advisor to graduate students.

Transfer Credit

Transfer credit is not accepted in the certificate program.

GENDER, SEXUALITY, AND WOMEN'S STUDIES

- Graduate Certificate in Gender, Sexuality, and Women's Studies

Graduate Program

womensandgenderstudies.charlotte.edu

Graduate Certificate in Gender, Sexuality, and Women's Studies

The Graduate Certificate in Gender, Sexuality and Women's Studies can be earned in conjunction with master's or doctoral work in a wide variety of subjects. The certificate can also be earned through a freestanding course of study not linked to a graduate degree. The Graduate Certificate in Gender, Sexuality and Women's Studies exposes students from a variety of disciplines to the core theories and approaches used in studies of women, gender (which includes masculinity), feminism, and sexuality.

Admission Requirements

The certificate program is open to all students who hold a bachelor's degree from a college or university accredited by an accepted accrediting body and either:

- 1.) are enrolled and in good standing in a graduate degree program at UNC Charlotte, or
- 2.) have a minimum undergraduate GPA of 3.0

All students are admitted to the Graduate School in a special category for certificate programs. In addition to the general requirements for graduate certificate programs explained under the "Degree Requirements and Academic Policies" section of the *Catalog*, students should submit a letter explaining the applicant's educational and work background, interests, and plans, with an emphasis on how this certificate will enhance, complement, or advance the applicant's work and/or education. Letters of recommendation are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the

Graduate Catalog for more information about Early Entry Programs.

Certificate Requirements

The Graduate Certificate in Gender, Sexuality and Women's Studies requires the completion of a minimum of 12 credit hours of graduate coursework focused on women, gender, or sexuality. These courses may be seminars, directed reading, or directed search courses. At least two of these courses (6 credit hours) must be graduate courses with a WGST prefix. Up to two courses (6 credit hours) may be taken from another department or program and need not have a WGST prefix as long as they focus on women, gender, or sexuality. Such courses must be approved by the Graduate Program Director to count toward the 12 credit hour requirement. Transfer credit is not accepted for the certificate program.

Certificate Total = 12 Credit Hours

- program
- An essay describing the applicant's relevant experience and objectives in undertaking graduate study in Gerontology
- A resume

Applications for admission to the Graduate Certificate in Gerontology program are considered as they are received, and admissions are ongoing. Students are admitted to the Graduate School in a special category for certificate students.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate certificate before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Certificate Requirements

The Graduate Certificate Program requires completion of a minimum of 12 credit hours of graduate coursework related to aging and older adults.

Core Course (3 credit hours)

This course provides a foundational and interdisciplinary understanding of aging and older adults.

GRNT 6600 - Current Issues in Aging (3)

Elective Courses (9 credit hours)

Select one course from each of the following tracks*.

Social Science Course (3 credit hours)

Select one of the following:

- GRNT 5150 - Older Individual and Society (3)
- GRNT 5290 - The Experience of Loneliness (3)
or SOCY 5290 - The Experience of Loneliness (3)
- GRNT 5353 - Environments for Aging (3)
or SOWK 5353 - Environments for Aging (3)
- GRNT 6124 - Psychology of Aging (3)
or PSYC 6124 - Psychology of Aging (3)
- GRNT 6130 - Sociology of Aging: Theories and Research (3)
or SOCY 6130 - Sociology of Aging: Theories and Research (3)
- GRNT 6134 - Family Caregiving Across the Lifespan: Theory, Practice, and Policy (3)
or SOCY 6134 - Family Caregiving Across the Lifespan: Theory, Practice, and Policy (3)
or SOWK 6134 - Family Caregiving Across the Lifespan: Theory, Research, and Policy (3)
- SOCY 6112 - The Sociology of Work (3)

SOWK 5101 - Social Work Practice with Older Adults and Families (3)

Health Science Course (3 credit hours)

Select one of the following:

- GRNT 5260 - Women: Middle Age and Beyond (3)
- GRNT 5280 - The Experience of Dementia (3)
or SOWK 5280 - The Experience of Dementia (3)
- GRNT 5365 - Grief and Loss Across the Lifespan (3)
or SOWK 5365 - Grief and Loss over the Lifespan (3)
- GRNT 6275 - Health Promotion, Nutrition, and Wellness for Older Adults (3)
- CSLG 6205 - Counseling Older Adults (3)
- CSLG 7681 - Grief and Loss Counseling (3)
- KNES 5232 - Physiology of Human Aging (3)
- NURS 6275 - Health Promotion, Nutrition, and Wellness for Older Adults (3)

Administration Course (3 credit hours)

Select one of the following:

- GRNT 5250 - Aging Programs and Services (3)
- GRNT 6210 - Aging and Public Policy (3)
- GRNT 6211 - Administration of Aging Programs (3)
- ADMN 6101 - Perspectives on Adult Learning Theory (3)
- HADM 6100 - Introduction to the U.S. Healthcare System (3)
- MPAD 6128 - Foundations of Public Policy (3)
- MPAD 6210 - Aging and Public Policy (3)
- MPAD 6211 - Administration of Aging Programs (3)
- NURS 6115 - Health Policy and Planning in the U.S. (3)

**Note: With approval of the Gerontology Graduate Program Director, topics courses may fulfill elective track courses depending upon their individual focus. The Graduate Program Director will make this determination each semester.*

GRNT 5050 - Topics in Gerontology (1 to 4)

GRNT 6050 - Topics in Gerontology (3)

Optional Course

The following optional course is available to all students in the Graduate Certificate in Gerontology program. However, it does not count toward the 12 credit hours required for graduation.

GRNT 6400 - Practicum (3)

Certificate Total = 12 Credit Hours

Transfer Credit

Credit hours taken at other institutions cannot transfer into the Graduate Certificate in Gerontology program. Only UNC Charlotte credit hours may be used to transfer into the Graduate Certificate in Gerontology program.

GERONTOLOGY

- Graduate Certificate in Gerontology

Gerontology Program
gerontology.charlotte.edu

Graduate Certificate in Gerontology

The Graduate Certificate in Gerontology is designed to provide graduate education in Gerontology for those who already have a graduate degree in another field, those currently completing a graduate degree in another field, who are interested in working with older adults, and others seeking a credential to work in the aging field. It requires completion of a foundational class, followed by one elective from each elective track. A 150-hour practicum experience is also available for students who desire this opportunity, but does not count towards the 12 credit hours required to graduate with the certificate.

Admission Requirements

In addition to the general requirements for admission to a certificate program, applicants must provide:

- Official transcripts of all baccalaureate and graduate work attempted

Two letters of recommendation from persons familiar with the applicant's professional and personal qualifications; these letters may be waived if the student is already enrolled in a master's or doctoral

HEALTH PSYCHOLOGY

- Ph.D. in Health Psychology
 - Clinical Health
 - Community Health
 - General Health

Graduate Program
healthpsych.charlotte.edu

Ph.D. in Health Psychology

Health Psychology is dedicated to conducting basic and applied research examining the contribution of biological, psychological, behavioral, social, cultural, and environmental factors to health and illness.

Health Psychology builds from principles and theories of other areas of psychology, biology, health, and social sciences. Health psychologists are concerned with promotion and maintenance of health, the prevention and treatment of illness across the lifespan, and improvement of systems that promote and maintain health.

A particular emphasis of the Health Psychology program is on the development, implementation, and evaluation of prevention and treatment interventions that involve multiple disciplines. The program has links with other colleges, departments, and programs in the University including the College of Health and Human Services, College of Education, and the Gerontology Program which allows students to select health courses across disciplines.

The Health Psychology doctoral program at UNC Charlotte offers students an opportunity to obtain their Ph.D. in Health Psychology in one of three concentrations: Behavioral Science, Clinical, or Community.

Admission Requirements

Applicants are expected to have a minimum of 18 credit hours of coursework in psychology, including Introductory Psychology and Research Methods, coursework in undergraduate statistics, previous research experience, and an excellent academic track record as demonstrated by undergraduate or graduate grade point averages.

Additionally, students who succeed in the Health Psychology program are hardworking, competent, disciplined scholars with interests in the science of Health Psychology and other health-related fields. Students must demonstrate intellectual curiosity and a passion for the science of psychology. It is important for student

applicants to determine if their professional interests are well matched to the expertise of our faculty members.

Documents to be Submitted for Application for Admission

Applicants are expected to complete an application online to the Graduate School. The application also must include transcripts of all completed academic work, three letters of reference from persons, preferably psychologists, who can speak to the applicant's promise as a doctoral student, a two page statement of professional goals and research interests, and a current resume or CV. International students must submit official TOEFL or IELTS test scores. Minimum score required for the TOEFL: of at least 557 on the written test or 83 on the computer-based test. Minimum score required for the TOEFL: 83 on the internet-based test. Minimum overall band score required for the IELTS is 6.5. All tests must be taken within the last two years.

Admission Assessment

Admissions reviews are conducted by faculty in each concentration. The deadline for all application materials is in mid-November or early December. Review of applications typically occurs in January, interviews are held in February, and admissions offers are typically made in March.

Degree Requirements

For the Behavioral Science and Community concentrations, 75 and 78 credit hours (post-baccalaureate), respectively, are required. All coursework taken at UNC Charlotte that counts toward the Ph.D. is at the 6000 level or above. The majority of the coursework is at the 8000 level. For the Clinical Health concentration, which enables students to become eligible for licensure as a Health Services Provider, 85 credit hours (post-baccalaureate) are required.

Each concentration's curriculum has 5 major components:

- 1) Core Health Psychology
- 2) Research Methodology and Analytics
- 3) Concentration (Behavioral Science, Clinical, or Community)
- 4) Interdisciplinary Content
- 5) Electives

Specific requirements within each component vary by concentration.

Behavioral Concentration (72 credit hours)

Core Health Psychology Courses (12 credit hours)

HPSY 8200 - Health Psychology I (3)
HPSY 8201 - Health Psychology II (3)
HPSY 8243 - Health Psychology in Action (3)
PHIL 8240 - Research Ethics in the Biological and Behavioral Sciences (3)

Research Methodology and Analytics Courses (27 credit hours)

HPSY 8102 - Research Design and Quantitative Methods in Psychology (3)
HPSY 8103 - Basic Quantitative Analyses for Behavioral Sciences (3)
HPSY 8262 - Practicum in Health Psychology (1 to 3) (*minimum 3 credit hours and up to 12 credit hours allowed*)*
HPSY 8899 - Readings and Research in Psychology (1 to 4) (*minimum 3 credit hours and up to 6 credit hours allowed*)*
HPSY 8999 - Doctoral Dissertation Research (1 to 9) (*minimum 3 credit hours and up to 9 credit hours allowed*)*

** Note: A maximum of 12 credit hours of HPSY 8899 or HPSY 8999 combined are allowed.*

Advanced Methodology Courses

Select three of the following:

EPID 8272 - Survival Analysis (3)
EPID 8273 - Multilevel and Longitudinal Data Analysis (3)
EPID 8276 - Systematic Reviews and Meta-Analysis (3)
GEOG 6209 - Social Network Analysis (3)
HLTH 8221 - Qualitative Research in Behavioral Sciences (3)
HLTH 8222 - Qualitative Research II: Theory Generation and Analysis in Behavioral Sciences (3)
HLTH 8281 - Measurement and Scale Development (3)
HLTH 8282 - Health Survey Design and Research (3)
HPSY 8104 - Advanced Quantitative Analyses for Behavioral Sciences (3)
HPSY 8145 - Applied Research Design and Program Evaluation (3)
OSCI 8206 - Qualitative Research Methods (3)
OSCI 8208 - Advanced Qualitative Data Analysis (3)
OSCI 8650 - Research Methods Seminar in Organizational Science (3)
PPOL 8665 - Analytic Epidemiology (3)
RSCH 8111 - Qualitative Research Methods (3)
RSCH 8112 - Survey Research Methods (3)
RSCH 8120 - Advanced Statistics (3)
RSCH 8121 - Qualitative Data Collection and Analysis (3)
RSCH 8140 - Multivariate Statistics (3)
RSCH 8150 - Structural Equation Modeling (3)
RSCH 8160 - Hierarchical Linear Models in Education (3)
RSCH 8220 - Educational and Psychological Measurement (3)

Concentration Courses (12 credit hours)

HPSY 8601 - Foundations in Psychology I: Physiological, Cognitive, and Affective Basis of Human Behavior (3)
HPSY 8602 - Foundations in Psychology II: Developmental, Community, and Social Basis of Behavior (3)
HPSY 8602 - Experimental Research Seminar (6) (*A total of 6 credit hours are required.*)*

Interdisciplinary Courses (12 credit hours)

Select four of the following:

ANTH 6613 - Seminar in Medical Anthropology (3)
 COMM 6000 - Topics in Communication
 Studies (3) (*Narratives of Health and Illness; Gendered Bodies; Interpersonal Process in Health Contexts*)
 GEOG 6209 - Social Network Analysis (3)
 GRNT 6124 - Psychology of Aging (3)
 GRNT 6134 - Family Caregiving Across the Lifespan:
 Theory, Practice, and Policy (3)
 GRNT 6210 - Aging and Public Policy (3)
 or MPAD 6210 - Aging and Public Policy (3)
 GRNT 6600 - Current Issues in Aging (3)
 HLTH 6103 - Maternal and Child Health Systems (3)
 HLTH 6104 - Population Perspectives on Nutrition and
 Physical Activity (3)
 HLTH 6220 - Applied Health Behavior Change (3)
 HLTH 6227 - Community Health Planning and
 Evaluation (3)
 HLTH 8220 - Theories and Interventions in Behavioral
 Science (3)
 HPSY 8145 - Applied Research Design and Program
 Evaluation (3)
 HPSY 8155 - Community Psychology (3)
 HPSY 8255 - Community Interventions (3)
 HPSY 8455 - Practicum in Community Psychology (1 to 3)
 HSRD 8000 - Topics in Health Services Research (1 to 4)
 HSRD 8202 - Healthcare Systems and Delivery (3)
 HSRD 8203 - Economics of Health and Healthcare (3)
 or PPOL 8667 - Economic of Health and
 Healthcare (3)
 HSRD 8204 - Health Policy (3)
 KNES 6285 - Advanced Cardiopulmonary Physiology (3)
 MPAD 6104 - Public Organizations and Management (3)
 MPAD 6311 - Introduction to Nonprofit Management (3)
 NUDN 8160 - Global Health and Social Justice (3)
 NUDN 8202 - Community Epidemiology (3)
 NURS 6115 - Health Policy and Planning in the U.S. (3)
 PPOL 8000 - Topics in Public Policy (1 to 4)
 PPOL 8661 - Social Organization of Healthcare (3)
 PPOL 8663 - Health Policy (3)
 SOCY 6090 - Topics in Sociology (3)

Elective Courses (9 credit hours)

Select three courses from the following:

HPSY 8260 - Topics in Health Psychology (3) (*Mindfulness*)
 PSYC 6113 - Physiological Psychology (3)
 PSYC 6115 - Sensation and Perception (3)
 PSYC 6116 - Cognition (3)
 PSYC 6124 - Psychology of Aging (3)
 PSYC 6130 - Social Psychology (3)
 PSYC 6216 - Introduction to Cognitive Science (3)
 PSYC 6999 - Thesis (*up to 6 credit hours allowed*) (*if student is co-enrolled in an M.A. in Psychology program*)

Clinical Concentration (85 credit hours)

Core Health Psychology Courses (12 credit hours)

HPSY 8107 - Ethical and Professional Issues in Psychology (3)
 HPSY 8200 - Health Psychology I (3)
 HPSY 8201 - Health Psychology II (3)
 HPSY 8243 - Health Psychology in Action (3)

Research Methodology and Analytics Courses (21 credit hours)

HPSY 8102 - Research Design and Quantitative Methods in Psychology (3)
 HPSY 8103 - Basic Quantitative Analyses for Behavioral Sciences (3)

Take one of the following three courses to meet the psychometrics requirement:

HLTH 8281 - Measurement and Scale Development (3)
 or OSCI 8650 - Research Methods Seminar in Organizational Science (3)
 or RSCH 8220 - Educational and Psychological Measurement (3)
 HPSY 8899 - Readings and Research in Psychology (1 to 4) (*minimum 3 credit hours and up to 6 credit hours allowed*)**

HPSY 8999 - Doctoral Dissertation Research (1 to 9) (*minimum 3 credit hours and up to 9 credit hours allowed*)**

*** Note: A maximum of 12 credit hours of HPSY 8899 or HPSY 8999 combined are allowed.*

Concentration Courses (43 credit hours)

Clinical Courses (37 credit hours)

HPSY 8050 - Topics in Psychological Treatment (3)
 HPSY 8141 - Intellectual Assessment (3)
 HPSY 8142 - Personality Assessment (3)
 HPSY 8150 - Introduction to Psychological Treatment (3)
 HPSY 8151 - Psychopathology (3)
 HPSY 8240 - History and Systems of Psychology (3)
 HPSY 8245 - Clinical Supervision and Consultation in Psychology (3)
 HPSY 8450 - Practicum in Clinical Psychology (1 to 3) (*16 credit hours; at least 10 credit hours to be completed in residence in the program*)
 HPSY 8550 - Internship (0)

Breadth Courses (6 credit hours)

HPSY 8601 - Foundations in Psychology I: Physiological, Cognitive, and Affective Basis of Human Behavior (3)
 HPSY 8602 - Foundations in Psychology II: Developmental, Community, and Social Basis of Behavior (3)

Interdisciplinary Courses (9 credit hours)

Select three of the following:

ANTH 6613 - Seminar in Medical Anthropology (3)

COMM 6000 - Topics in Communication Studies (3)
 EPID 8272 - Survival Analysis (3)
 EPID 8273 - Multilevel and Longitudinal Data Analysis (3)
 EPID 8276 - Systematic Reviews and Meta-Analysis (3)
 GEOG 6209 - Social Network Analysis (3)
 GRNT 6124 - Psychology of Aging (3)
 GRNT 6134 - Family Caregiving Across the Lifespan:
 Theory, Practice, and Policy (3)
 GRNT 6210 - Aging and Public Policy (3)
 or MPAD 6210 - Aging and Public Policy (3)
 GRNT 6600 - Current Issues in Aging (3)
 HLTH 6103 - Maternal and Child Health Systems (3)
 HLTH 6104 - Population Perspectives on Nutrition and
 Physical Activity (3)
 HLTH 6227 - Community Health Planning and
 Evaluation (3)
 HLTH 6228 - Social Determinants of Health (3)
 HLTH 6220 - Applied Health Behavior Change (3)
 HLTH 8220 - Theories and Interventions in Behavioral
 Science (3)
 HLTH 8221 - Qualitative Research in Behavioral
 Sciences (3)
 HLTH 8222 - Qualitative Research II: Theory Generation
 and Analysis in Behavioral Sciences (3)
 HLTH 8282 - Health Survey Design and Research (3)
 HLTH 8602 - Communicating and Disseminating
 Research (1)
 HPSY 8145 - Applied Research Design and Program
 Evaluation (3)
 HPSY 8155 - Community Psychology (3)
 HPSY 8255 - Community Interventions (3)
 HPSY 8455 - Practicum in Community Psychology (1 to 3)
 HSRD 8000 - Topics in Health Services Research (1 to 4)
 HSRD 8202 - Healthcare Systems and Delivery (3)
 HSRD 8203 - Economics of Health and Healthcare (3)
 or PPOL 8667 - Economic of Health and
 Healthcare (3)
 HSRD 8204 - Health Policy (3)
 KNES 6285 - Advanced Cardiopulmonary Physiology (3)
 MPAD 6104 - Public Organizations and Management (3)
 MPAD 6311 - Introduction to Nonprofit Management (3)
 NUDN 8160 - Global Health and Social Justice (3)
 NUDN 8202 - Community Epidemiology (3)
 NURS 6115 - Health Policy and Planning in the U.S. (3)
 NURS 6282 - Interprofessional Collaboration in
 Healthcare (3)
 OSCI 8206 - Qualitative Research Methods (3)
 OSCI 8208 - Advanced Qualitative Data Analysis (3)
 PPOL 8661 - Social Organization of Healthcare (3)
 PPOL 8663 - Health Policy (3)
 PPOL 8000 - Topics in Public Policy (1 to 4)
 PPOL 8665 - Analytic Epidemiology (3)
 RSCH 8111 - Qualitative Research Methods (3)
 RSCH 8112 - Survey Research Methods (3)
 RSCH 8120 - Advanced Statistics (3)
 RSCH 8121 - Qualitative Data Collection and Analysis (3)
 RSCH 8140 - Multivariate Statistics (3)

RSCH 8150 - Structural Equation Modeling (3)
 RSCH 8160 - Hierarchical Linear Models in Education (3)
 SOCY 6090 - Topics in Sociology (3)

Community Concentration (78 credit hours)

Core Health Psychology Courses (12 credit hours)

HPSY 8200 - Health Psychology I (3)
 HPSY 8201 - Health Psychology II (3)
 HPSY 8243 - Health Psychology in Action (3)
 PHIL 8240 - Research Ethics in the Biological and
 Behavioral Sciences (3)

Research Methodology and Analytics Courses (21 credit hours)

HPSY 8102 - Research Methodologies in Behavioral
 Sciences (3)
 HPSY 8103 - Basic Quantitative Analyses for Behavioral
 Sciences (3)
 HPSY 8899 - Readings and Research in Psychology (1 to 4)
*(minimum 3 credit hours and up to 6 credit hours
 allowed)**
 HPSY 8999 - Doctoral Dissertation Research (1 to 9)
*(minimum 3 credit hours and up to 9 credit hours
 allowed)**

**** Note: A maximum of 9 credit hours of HPSY 8899 or
 HPSY 8999 combined are allowed.*

Advanced Methodology Courses

*Select two of the following, after obtaining advisor's
 permission:*

EPID 8272 - Survival Analysis (3)
 EPID 8273 - Multilevel and Longitudinal Data Analysis (3)
 EPID 8276 - Systematic Reviews and Meta-Analysis (3)
 GEOG 6209 - Social Network Analysis (3)
 HLTH 8221 - Qualitative Research in Behavioral
 Sciences (3)
 HLTH 8222 - Qualitative Research II: Theory Generation
 and Analysis in Behavioral Sciences (3)
 HLTH 8281 - Measurement and Scale Development (3)
 HLTH 8282 - Health Survey Design and Research (3)
 HPSY 8104 - Advanced Quantitative Analyses for
 Behavioral Sciences (3)
 HPSY 8099 - Topics in Psychology (3) *(Measurement and
 Scale Development)*
 OSCI 8206 - Qualitative Research Methods (3)
 OSCI 8208 - Advanced Qualitative Data Analysis (3)
 OSCI 8650 - Research Methods Seminar in Organizational
 Science (3)
 PPOL 8000 - Topics in Public Policy (1 to 4) *(Categorical
 Data Analyses)*
 PPOL 8665 - Analytic Epidemiology (3)
 RSCH 8111 - Qualitative Research Methods (3)
 RSCH 8112 - Survey Research Methods (3)

RSCH 8120 - Advanced Statistics (3)
 RSCH 8121 - Qualitative Data Collection and Analysis (3)
 RSCH 8140 - Multivariate Statistics (3)
 RSCH 8150 - Structural Equation Modeling (3)
 RSCH 8160 - Hierarchical Linear Models in Education (3)
 RSCH 8220 - Educational and Psychological Measurement (3)

Concentration Courses (15 credit hours)

HPSY 8145 - Applied Research Design and Program Evaluation (3)
 HPSY 8155 - Community Psychology (3)
 HPSY 8255 - Community Interventions (3)
 HPSY 8455 - Practicum in Community Psychology (1 to 3)

 or PSYC 8355 - Community Research Practicum (3)

***A total of 6 credit hours of practicum are required.

Interdisciplinary Courses (18 credit hours)

Select six of the following:

ANTH 6613 - Seminar in Medical Anthropology (3)
 COMM 6000 - Topics in Communication Studies (3) (*Narratives of Health and Illness*)
 GRNT 6210 - Aging and Public Policy (3)
 or MPAD 6210 - Aging and Public Policy (3)
 GRNT 6600 - Current Issues in Aging (3)
 HLTH 6103 - Maternal and Child Health Systems (3)
 HLTH 6104 - Population Perspectives on Nutrition and Physical Activity (3)
 HLTH 6220 - Applied Health Behavior Change (3)
 HLTH 6227 - Community Health Planning and Evaluation (3)
 HLTH 6228 - Social Determinants of Health (3)
 HLTH 8220 - Theories and Interventions in Behavioral Science (3)
 HSRD 8000 - Topics in Health Services Research (1 to 4)
 HSRD 8202 - Healthcare Systems and Delivery (3)
 HSRD 8203 - Economics of Health and Healthcare (3)
 or PPOL 8667 - Economic of Health and Healthcare (3)
 HSRD 8204 - Health Policy (3)
 KNES 6285 - Advanced Cardiopulmonary Physiology (3)
 MPAD 6104 - Public Organizations and Management (3)
 MPAD 6311 - Introduction to Nonprofit Management (3)
 NUDN 8160 - Global Health and Social Justice (3)
 NUDN 8202 - Community Epidemiology (3)
 NURS 6115 - Health Policy and Planning in the U.S. (3)
 PPOL 8661 - Social Organization of Healthcare (3)
 PPOL 8663 - Health Policy (3)
 PPOL 8000 - Topics in Public Policy (1 to 4)
 PPOL 8665 - Analytic Epidemiology (3)
 SOCY 6090 - Topics in Sociology (3)

Elective Courses (12 credit hours)

Select four of the following:

HPSY 8099 - Topics in Psychology (3) (*Developmental Psychology*)
 HPSY 8260 - Topics in Health Psychology (3) (*Mindfulness*)
 HPSY 8601 - Foundations in Psychology I: Physiological, Cognitive, and Affective Basis of Human Behavior (3)
 HPSY 8602 - Foundations in Psychology II: Developmental, Community, and Social Basis of Behavior (3)
 PSYC 6113 - Physiological Psychology (3)
 PSYC 6115 - Sensation and Perception (3)
 PSYC 6116 - Cognition (3)
 PSYC 6124 - Psychology of Aging (3)
 PSYC 6130 - Social Psychology (3)
 PSYC 6216 - Introduction to Cognitive Science (3)
 PSYC 6999 - Thesis (*up to 6 credit hours allowed*) (*if student is co-enrolled in an M.A. in Psychology program*)

Degree Total = 72-85 Credit Hours

Grade Requirements

Graduate students must have a 3.0 GPA in the courses on their degree plan of study in order to graduate. More than two grades of C or one U results in termination from the program.

Plan of Study

Students develop a plan of study with their advising committees.

Graduate Course Requirements

Doctoral courses are numbered at the 8000 level.

The curriculum has 4 major curricular components:

1. Core Health Psychology
2. Research
3. Interdisciplinary Content
4. Concentration (General, Clinical, or Community)

Specific requirements within each component vary by concentration. Specifics can be found in the graduate catalog.

Student Advising

Students are assigned an advisor before the first semester. Students in consultation with the advisor create an advising committee constituted by three health psychology faculty: two members should be trained as psychologists and one member should be trained in a discipline other than psychology. Students in the Clinical concentration must have a clinical psychologist on their advising committee. The student meets with the committee regularly for issues of professional development and guidance in the program. Students may change advisors with permission of the Program Director.

Other Requirements

- Master's thesis or second year research project
- Written comprehensive project prior to beginning dissertation research
- Dissertation
- Year-long, pre-doctoral internship (Clinical concentration students only)

Time Limits for Completion

Students are admitted for full-time study only. Students entering the doctoral program post-baccalaureate must complete their degree, including the dissertation, within nine years. Full-time students must meet benchmark requirements each year to maintain their status as a doctoral student. These benchmarks are intended to help students achieve their goal of completing the doctorate in a timely manner. See the *Health Psychology Student Handbook* for a detailed description of the timeline for completing programmatic milestones.

The graduate school has specific requirements that students should be familiar with. Please see the relevant sections of this *Catalog* for specific details.

Second Year Project

The second year project is meant to immerse students in a practical research experience that will help them develop skills to conduct independent research projects. Students are expected to develop and carry out this project under close supervision from their primary academic advisor. A manuscript that follows the format of typical empirical articles in psychology, but is typically substantially longer, should be turned into the student's primary advisor and members of their advisory committee.

Comprehensive (Qualifying) Project

Qualifying projects are meant to demonstrate broad competence as a scholar in the disciplines of Health Psychology, interdisciplinary health, and the concentration-specific discipline (Behavioral, Clinical, or Community). The Comprehensive Project results in a practical product that demonstrates integration of knowledge from these three areas. In addition, it provides an opportunity to strengthen and develop a student's skills, as specified by their advisory committee. Projects are identified via a collaborative process, involving the student and their committee. The Comprehensive Project acts as the gateway into the 4th year and dissertation. Students must pass their Comprehensive Project successfully to continue in the program.

Each student's advisory committee, in consultation with the Program Director, tailors the content and format of the Comprehensive Project with attention to the student's professional goals. The Comprehensive Project is comprised of a research portfolio (i.e., second year project/thesis, presentation at a national conference, and a

first author manuscript submitted for publication) and a statement of research and professional expertise and goals.

Students must complete their second year research projects prior to proposing the comprehensive project, must have at least a 3.0 GPA, must not be on probation, and must have removed any conditions placed upon them at the time of admission. Comprehensive Projects should be in process no later than the third academic year in the program. Comprehensive Projects must be completed successfully before students may rise to doctoral candidacy and propose their dissertation project.

Doctoral Committee

The doctoral committee is formed after successful completion of the qualifying project. The student must complete the graduate student petition to create the committee. The committee must include at least three members of the health psychology faculty as well as the Graduate School-appointed Graduate Faculty representative.

Dissertation

The dissertation must be successfully proposed and defended before being undertaken. The major advisor directly supervises the student on the dissertation project with support from the dissertation committee. See Graduate School policies regarding dissertations. Additional information regarding the dissertation project can be found in the *Health Psychology Student Handbook*.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Research Opportunities

Students in health psychology are expected to engage in collaborative and independent research activities. Many opportunities are available through the program, including experience in qualitative and quantitative research methods. Many Health Psychology faculty members engage in grant funded research and opportunities exist for research assistantships.

Transfer Credit

The maximum amount of transfer credit that a Ph.D. student may count towards a doctorate is 30 credit hours. The student's advising committee recommends transfer credits that are consistent with the student's program of study to the Graduate School for approval. It is highly unlikely that students in the Clinical concentration will be able to transfer clinical courses that were completed at a different university.

HISTORY

- M.A. in History
 - Public History
- Architecture (Critical Heritage Studies Concentration), M.S., and History (Public History Concentration), M.A., Dual Degree (*see College of Arts & Architecture section*)

Department of History

history.charlotte.edu

M.A. in History

The Master of Arts in History program at UNC Charlotte is designed to give motivated students an opportunity to pursue advanced studies in close collaboration with accomplished scholars. The program emphasizes the development of methodological, literary, and conceptual skills that graduates can employ as students in a doctoral program, as professionally oriented history teachers in secondary schools, as staff at museums or historic sites, or as citizens more acutely aware of the historical evolution of their society. Offering both day and evening courses, the Department of History attracts a diverse group of traditional and non-traditional students. Candidates may pursue the M.A. in History degree on either a full-time or part-time basis.

The Department offers courses in United States, European, and Latin American history, with particular expertise in the following areas:

- African American and Black Women's History
- American South, Old and New
- Colonial and Modern Latin America
- Comparative Slavery, Race and Race Relations, and the African Diaspora
- Early Modern and Modern Europe
- Environment, Labor and Business, Science, Medicine, and Technology
- Military, War, and International Relations
- Nationalism and Colonialism in World History
- Urban History, Immigration, and Ethnicity
- Women's History, Gender, and the Body

The Department also offers a concentration in the field of Public History. The program emphasizes museum studies, historic preservation, and the creation of new media projects such as websites, digital collections, and documentaries.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are ordinarily required for admission to the M.A. in History program:

- A minimum undergraduate GPA of 3.0 in History or a related discipline
- A personal statement outlining the candidate's background, interest, and goals in History
- Three letters of recommendation from former instructors and/or employers
- A writing sample of at least 6-8 pages

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Accelerated Master's Program

Academically talented high school seniors and UNC Charlotte undergraduate freshmen are encouraged to apply for the Accelerated Master's Program to begin work toward both undergraduate and graduate degrees in their Freshman year. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Accelerated Master's Programs.

Degree Requirements

The Master of Arts degree in History requires completion of at least 30 credit hours in approved graduate courses. These courses must include at least 24 credit hours in History, of which at least 15 credit hours are in seminars or colloquia open only to graduate students.

For M.A. thesis students, no more than 6 credit hours of elective courses can be at the 5000-level, in HIST 6984, HIST 6901, or outside the Department of History (in any combination). For M.A. comprehensive exam students, no more than 9 credit hours of elective courses can be at the 5000-level, in HIST 6894, HIST 6901, or outside the Department of History (in any combination).

Students taking the comprehensive examination may take 3 credit hours of exam preparation and students completing a thesis may take 6 credit hours of thesis preparation toward their 30 credit hours.

Students who pursue the Concentration in Public History must complete 30 credit hours of required and elective coursework, 3 credit hours for an internship in some area of Public History, and 3 credit hours of thesis work, for a total of 36 credit hours.

No more than six transferred credit hours may be approved for application to the requirements for the degree.

Students must complete all degree requirements, including the comprehensive examination or thesis defense, within seven calendar years of first enrollment in the program.

Required Courses for the M.A. in History

History Colloquia Courses (9 credit hours)

Select three of the following:

- HIST 6001 - Colloquium in United States History Before 1865 (3)
- HIST 6002 - Colloquium in United States History Since 1865 (3)
- HIST 6101 - Colloquium in 19th-Century European History (3)
- HIST 6102 - Colloquium in 20th-Century European History (3)
- HIST 6201 - Colloquium in Colonial Latin American History (3)
- HIST 6202 - Colloquium in Modern Latin American History (3)

Other Required Courses (6 credit hours)

- HIST 6693 - History and Methodology (3) *(to be taken in the Spring, after completion of at least six credit hours)*
- HIST 6694 - Seminar in Historical Writing (3) *(to be taken in the Fall of the second year, after completion of HIST 6693)*

Comprehensive Exam or Thesis (3-6 credit hours)

Select one of the following:

- HIST 6698 - Exam Preparation (3)
- HIST 6999 - Thesis (taken for 6 credit hours)

Required Courses for the M.A. in History with Concentration in Public History

History Colloquia Courses (6 credit hours)

Select two of the following:

- HIST 6001 - Colloquium in United States History Before 1865 (3)
- HIST 6002 - Colloquium in United States History Since 1865 (3)
- HIST 6101 - Colloquium in 19th-Century European History (3)
- HIST 6102 - Colloquium in 20th-Century European History (3)
- HIST 6201 - Colloquium in Colonial Latin American History (3)

HIST 6202 - Colloquium in Modern Latin American History (3)

Other Required Courses (21 credit hours)

HIST 6300 - Topics in Public History (3) *(or another approved public history elective)*

HIST 6310 - Museum Studies (3)

HIST 6320 - Historic Preservation (3)

HIST 6330 - History in the Digital Age (3)

HIST 6400 - Internship (3)

HIST 6693 - Historiography and Methodology (3) *(to be taken in the Spring, after completion of at least six credit hours)*

HIST 6694 - Seminar in Historical Writing (3) *(to be taken in the Fall of the second year, after completion of HIST 6693)*

Comprehensive Exam or Thesis (3-6 credit hours)

Select one of the following:

HIST 6998 - Exam Preparation (3)

HIST 6999 - Thesis (3 or 6) *(taken for 3 credit hours)*

Consult the department website at history.charlotte.edu for a more detailed description of program requirements and suggested courses of study.

Elective Courses

HIST 5000 - Problems in American History (3)

HIST 5001 - Problems in European History (3)

HIST 5002 - Problems in Non-Western History (3)

HIST 6000 - Topics in History (3)

HIST 6300 - Topics in Public History (3)

HIST 6894 - Readings in History (3)

HIST 6901 - Directed Readings/Research (3)

HIST 6997 - Directed Research (3)

In addition to the above listed courses, all other History courses at the 6000 level may count as an elective, including the colloquia, if students take additional credit hours beyond the already completed requirements. For example, if a student takes four colloquia, the fourth counts as an elective.

Students may also elect to take up to 6 or 9 credit hours of graduate-level coursework in disciplines other than History, depending on whether they pursue the thesis or comprehensive exam, respectively. Candidates seeking graduate-level teacher certification may use the elective option to take courses in professional education selected in consultation with the College of Education. If a student needs more than that number of elective hours to satisfy certification requirements, those hours will be added to the total required for the M.A. in History.

Degree Total = 30-36 Credit Hours

Grade Requirements

All students in the program are expected to maintain an overall B average (3.0 GPA). Students who do not meet this expectation will be subject to suspension on recommendation of the Graduate Committee of the Department of History.

Advising

Students may not register for graduate-level courses without the permission of the Department of History. Consequently, students must be advised by the Graduate Program Director, either in person or by phone or email, prior to registering for courses each semester, as well as prior to filing their application for degree.

Language Requirement

Although students are not required to demonstrate proficiency in a foreign language, they are expected to be able to use whatever languages they need to pursue their research interests.

Thesis/Comprehensive Examination

After completing the required courses, students must either prepare a Master's thesis based on original primary research or take three comprehensive written examinations based on reading lists compiled in consultation with faculty members. Students intending to write theses must first write and then defend a thesis proposal. M.A. candidates completing either the thesis or exam must then pass an oral defense of their written work.

An Examining Committee, consisting of two graduate faculty members from the Department of History and a third member selected from History or another department, oversees the student's thesis work or conducts the comprehensive written and oral examinations.

Assistantships

The Department of History currently supports eight students with teaching assistantships, two students with editorial assistantships, and occasionally provides support for other students via administrative assistantships. Assistantships are currently funded at \$9,000 per academic year. From time to time, the department also provides students with other employment opportunities.

See the section Financial Assistance below for additional information on resources available to graduate students in the Department of History.

Internships

Internships are available to all students and required for those in the Public History program. Some are available

within the department; others with a variety of historical museums and sites.

Financial Aid/Financial Assistance

Students may obtain limited financial support from paid internships, summer or adjunct teaching in the department, archival work in the library's Special Collections, and teaching opportunities at local community colleges. Students doing thesis research or presenting papers at professional conferences may receive modest travel grants from the department or from the Graduate and Professional Student Government.

Information on non-departmental forms of financial assistance is available from the Office of Student Financial Aid.

INTERDISCIPLINARY STUDIES

• M.A. in Interdisciplinary Studies

Graduate Program

mals.charlotte.edu

M.A. in Interdisciplinary Studies

The Master of Arts in Interdisciplinary Studies degree program (MAIS) is primarily designed for adults seeking to enhance their general education in the liberal arts at the graduate level. It provides a flexible, multidisciplinary framework to accommodate the varied undergraduate backgrounds and personal interests that students bring to the program. The curriculum draws upon the full range of the liberal arts studies, including humanities, social sciences, and natural sciences courses. The emphasis is on an interdisciplinary, liberal arts education rather than on specialized, single disciplinary study or professional training.

For recent recipients of the baccalaureate degree, the Interdisciplinary Studies program may provide the insight needed to make an informed career choice. For returning students, graduate interdisciplinary studies may enhance opportunities in a career already launched or renew ties with university life. For persons with significant work experience, the program offers a chance to integrate the life of the mind with that of the workplace. Just as students come to the Interdisciplinary Studies program from a variety of fields, so they pursue a variety of careers after graduation. The most widely represented are in business, education, government, law, and social services.

The degree can be completed in two years as a full-time student and, possibly, three years as a part-time student. While some courses are offered at night and online, many others are offered during the weekday.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Interdisciplinary Studies:

- 1) A GPA of at least 3.0 on academic work beyond high school and 3.0 for courses prerequisite to the area of proposed graduate study

- 2) A two-page essay describing the applicant's objectives in undertaking graduate work in Interdisciplinary Studies. Students are encouraged to articulate an area of study that they would like to study during their time in the program.
- 3) A resume of employment history or volunteer experience (for applicants who have been out of school for at least five years or whose baccalaureate degree was delayed)

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Degree Requirements

The master's program in Interdisciplinary Studies requires a minimum of 30 credit hours of graduate work, including at least 15 credit hours in courses open only to graduate students.

Students must take three core MAIS courses for a total of 9 credit hours. The remaining seven courses (21 credit hours) may be taken in any department(s), with approval. This flexibility allows students to customize the MAIS curriculum to their individual needs and interests, working in concert with their professors and the MAIS Graduate Program Director.

Students may enroll in the MAIS program after completing or in the process of obtaining a graduate certificate. Up to 12 credit hours from the certificate will be counted for the MAIS degree. The final 18 credit hours are composed of the 9 credit hours of MAIS core courses and 9 credit hours from the interdisciplinary, liberal arts interest of the students. This ensures both an interdisciplinary, liberal arts experience for the students and the ability to finish the MAIS degree in a timely manner.

Core Courses (9 credit hours)

IDST 6101 - The Interdisciplinary Research Tradition (3)
 IDST 6102 - Writing and Thinking Across the Disciplines (3)
 IDST 6600 - Liberal Studies Capstone Seminar (3)

Elective Courses (21 credit hours)

Select seven additional courses from any department(s), with the instructor's permission and approval. The courses must be chosen in consultation with the MAIS Graduate Program Director. Students are strongly encouraged to take courses across departments and disciplines in ways that expand their knowledge and analysis of a specific topic of interest.

No more than 6 credit hours of directed reading/research or independent study may be applied to the degree. Approval for IDST 6890 (Directed Research) comes from the Graduate Director and the disciplinary instructor. A form for IDST 6890 is available in the Director's office and

must be completed and the directed reading/research or study approved in advance of registration.

Degree Total = 30 Credit Hours

Grade Requirements

Students must have a cumulative GPA of 3.0 in courses in their degree plan of study in order to graduate. Please consult the Graduate School's grading policies under "Degree Requirements and Academic Policies."

LANGUAGES, CULTURES AND TRANSLATION

- **M.A. in Spanish**
 - Language, Literature, and Culture
 - Translation and Interpreting Studies
- **Graduate Certificate in LANG: Business Languages**
 - Spanish
- **Graduate Certificate in LANG: Translating**
 - French
 - Japanese
 - Russian
 - Spanish
- **Graduate Certificate in LANG: Translation and Interpreting Studies, Spanish-English**

Department of Languages, Cultures, and Translation

languages.charlotte.edu

M.A. in Spanish

The Master of Arts in Spanish serves individuals who seek a greater understanding of Spanish language, literatures and cultures, and who seek career and professional advancement opportunities in education, translation, interpreting, applied language (Business Spanish). The M.A. also caters to those who contemplate pursuing a Ph.D. in fields such as Hispanic literature, linguistics, translation and interpreting studies, intercultural communication, or international studies.

The M.A. in Spanish provides a rich variety of graduate coursework in a major world language that is becoming increasingly important in the United States. The program builds on a comprehensive undergraduate curriculum and consists of two concentrations:

- 1) Language, Literature, and Culture (LLC)
- 2) Translation and Interpreting Studies (TIS)

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for the M.A. in Spanish:

A baccalaureate degree in Spanish or in a related field that required upper-division coursework in undergraduate Spanish (e.g., Latin American Studies, International Studies, International Business), with an overall GPA of at least 3.0 (on a 4.0 scale)

- **Degree** - A baccalaureate degree in Spanish or in a related field that required upper-division coursework in undergraduate Spanish (e.g., Latin American Studies, International Studies, International Business), with an overall GPA of at least 3.0 (on a 4.0 scale)
- **Essay** - A well-developed essay written in English that addresses the applicant's motivation for enrolling in the M.A. in Spanish, to include particular areas of research interests and career or professional goals
- **Writing Samples** - Students must demonstrate a high level of proficiency in both languages (English and Spanish) by providing writing samples in each language. Students seeking enrollment in the LLC concentration must submit a college term paper or a substantive writing sample (minimum 1,000 words) in Spanish and a second paper written in English. Students seeking enrollment in the TIS concentration may submit translation samples (one from English into Spanish and a second one from Spanish into English) or a college term paper or a substantive writing sample (minimum 1,000 words) in Spanish and a second paper written in English.
- **Interview** - An oral interview with the Graduate Program Director
- **Three Letters of Reference** - For those interested in the LLC concentration, at least two of the letters must be from professors. For those interested in the TIS concentration, at least one of the letters must come from a professor, and letters not written by a professor must be from professionals working in the field of Spanish, translation and interpreting, or a closely related area (e.g., Latin American Studies, International Studies, International Business). Letters not written by professors should not come from a friend or family member, but from a work supervisor or somebody in a similar professional capacity.

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Prerequisite Requirements

LLC concentration applicants who do not have advanced-level undergraduate coursework in Spanish language and the literature and culture of Spain and Latin America will be required to take a minimum of two courses in these

areas as part of their preparation for enrollment in the M.A. program. Such coursework may be taken as a post-baccalaureate graduate student (PBG), and up to 6 credit hours of such coursework with a grade of B or higher may be transferred forward to the M.A. program upon admission to the program. Applicants should consult with the Program Director for counseling.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Master of Arts in Spanish requires 30 graduate credit hours. For any course to count toward the M.A. in Spanish, it must have been taken within seven years from the date of enrollment in the program. No more than 6 credit hours evaluated with a grade of C may be counted toward the minimum hours required for the master's degree. Up to 9 credit hours of appropriate graduate coursework may be accepted for transfer from a college or university accredited by an accepted accrediting body. Additional non-residence credit for graduate study abroad may be possible via departmental pre-approval.

Concentrations

Language, Literature, and Culture (LLC) Concentration (30 credit hours)

The LLC concentration allows for an in-depth development of Spanish language skills and is especially recommended for teachers of Spanish. It also provides excellent preparation for individuals who may wish to pursue the Ph.D. in Spanish, for whom courses in literature and linguistics are especially recommended. Students take 24 credit hours of core courses (18 credit hours in Spanish and 6 credit hours in Translation/Interpreting). In addition, students take 6 credit hours, either as elective courses or as Thesis credits (SPAN 6902).

Core Courses in Spanish (18 credit hours)

Select 6 courses from the following:

- SPAN 5011 - Studies in Spanish American Prose Fiction (3)
- SPAN 5050 - Selected Topics in Spanish (1 to 3)
- SPAN 5120 - Advanced Business Spanish I (3)
- SPAN 5121 - Advanced Business Spanish II (3)
- SPAN 5202 - Twentieth Century Spanish Literature (3)
- SPAN 5205 - Novel of the Golden Age (3)
- SPAN 5210 - Studies in Spanish American Poetry (3)
- SPAN 5212 - Studies in Spanish American Theater (3)
- SPAN 5213 - Cervantes (3)

SPAN 5410 - Professional Internship in Spanish (1-6) (*up to 3 credit hours may be applied toward the degree*)

SPAN 6003 - Studies in Hispanic Culture and Civilization (3)

SPAN 6005 - Advanced Studies in Spanish Literature (3)

SPAN 6007 - Advanced Studies in Spanish American Literature (3)

SPAN 6201 - Hispanic Language and Culture through Media (3)

Core Courses in Translation and Interpreting Studies (6 credit hours)

Select 2 courses from the following:

INTE 5050 - Topics and Practicum in Interpreting (3)

INTE 6050 - Topics in Interpreting Studies (3)

INTE 6172 - Spanish-English Legal Interpreting (3)

INTE 6174 - Spanish-English Medical Interpreting (3)

INTE 6176 - Spanish-English Community Interpreting (3)

INTE 6601 - History, Theory, and Method of Interpreting (3)

LANG 5050 - Topics in Foreign Language (3)

TRAN 5050 - Topics in Translation Practica (3)

TRAN 6000 - Special Topics in Translation Studies (3)

TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)

TRAN 6474 - Workshop on Non-Literary Topics II (Medical and Technical) (3)

TRAN 6476 - Workshop on Literary and Cultural Topics (3)

TRAN 6480 - Translation Internship (1 to 6) (*Up to 3 credit hours may be applied toward the degree.*)

TRAN 6601 - History, Theory, and Method of Translation (3)

TRAN 6602 - Linguistics for Translators (3)

TRAN 6603 - Computer-Assisted Translating (3)

TRAN 6604 - Translation Project Management (3)

TRAN 6901 - Advanced Project in English↔Spanish Translating (1 to 3)

Elective Courses or Thesis Option (6 credit hours)

Select either 6 credit hours of electives or 6 credit hours of SPAN 6902 (Thesis).

Elective Courses (6 credit hours)

Select 2 courses from the following:

INTE 5050 - Topics and Practicum in Interpreting (3)

INTE 6050 - Topics in Interpreting Studies (3)

INTE 6172 - Spanish-English Legal Interpreting (3)

INTE 6174 - Spanish-English Medical Interpreting (3)

INTE 6176 - Spanish-English Community Interpreting (3)

INTE 6601 - History, Theory, and Method of Interpreting (3)

LANG 5050 - Topics in Foreign Language (3)

SPAN 5011 - Studies in Spanish American Prose Fiction (3)

SPAN 5050 - Selected Topics in Spanish (1 to 3)

SPAN 5120 - Advanced Business Spanish I (3)

SPAN 5121 - Advanced Business Spanish II (3)

SPAN 5202 - Twentieth Century Spanish Literature (3)

SPAN 5205 - Novel of the Golden Age (3)

SPAN 5210 - Studies in Spanish American Poetry (3)

SPAN 5212 - Studies in Spanish American Theater (3)

SPAN 5213 - Cervantes (3)
 SPAN 5410 - Professional Internship in Spanish (1 to 6) (*Up to 3 credit hours may be applied toward the degree.*)
 SPAN 6001 - Advanced Studies in Spanish Language (3)
 SPAN 6003 - Studies in Hispanic Culture and Civilization (3)
 SPAN 6005 - Advanced Studies in Spanish Literature (3)
 SPAN 6007 - Advanced Studies in Spanish American Literature (3)
 SPAN 6201 - Hispanic Language and Culture through Media (3)
 TRAN 5050 - Topics in Translation Practica (3)
 TRAN 6000 - Special Topics in Translation Studies (3)
 TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)
 TRAN 6474 - Workshop on Non-Literary Topics II (Medical and Technical) (3)
 TRAN 6476 - Workshop on Literary and Cultural Topics (3)
 TRAN 6480 - Translation Internship (1 to 6) (*Up to 3 credit hours may be applied toward the degree.*)
 TRAN 6601 - History, Theory, and Method of Translation (3)
 TRAN 6602 - Linguistics for Translators (3)
 TRAN 6603 - Computer-Assisted Translating (3)
 TRAN 6604 - Translation Project Management (3)
 TRAN 6901 - Advanced Project in English↔Spanish Translating (1 to 3)

Thesis (0-6 credit hours)

The master's thesis may include Spanish and Spanish American literature; Spanish and Spanish American civilization and culture (including literature and film studies); Spanish linguistics, methodology, applied language (Spanish for business and international trade); and other special topics in Spanish.

SPAN 6902 - Thesis (1-6)

Translation and Interpreting Studies (TIS) Concentration

The TIS concentration serves individuals interested in a career in professional translation or in enhancing their career or work opportunities as specialists in the language and culture industries. It also provides preparation for those who may wish to pursue a Ph.D. in fields such as Spanish, linguistics, translating and translation studies, intercultural communication, or international studies. Students take 24 credit hours of core courses (18 credit hours in Translation/Interpreting and 6 credit hours in Spanish). In addition, students take 6 credit hours, either as elective courses or as Thesis credits (TRAN 6902).

Core Courses in Spanish (6 credit hours)

Select 2 courses from the following:

SPAN 5011 - Studies in Spanish American Prose Fiction (3)
 SPAN 5050 - Selected Topics in Spanish (1 to 3)
 SPAN 5120 - Advanced Business Spanish I (3)
 SPAN 5121 - Advanced Business Spanish II (3)

SPAN 5202 - Twentieth Century Spanish Literature (3)
 SPAN 5205 - Novel of the Golden Age (3)
 SPAN 5210 - Studies in Spanish American Poetry (3)
 SPAN 5212 - Studies in Spanish American Theater (3)
 SPAN 5213 - Cervantes (3)
 SPAN 5410 - Professional Internship in Spanish (1 to 6) (*Up to 3 credit hours may be applied toward the degree.*)
 SPAN 6001 - Advanced Studies in Spanish Language (3)
 SPAN 6003 - Studies in Hispanic Culture and Civilization (3)
 SPAN 6005 - Advanced Studies in Spanish Literature (3)
 SPAN 6007 - Advanced Studies in Spanish American Literature (3)
 SPAN 6201 - Hispanic Language and Culture through Media (3)

Core Courses in Translation and Interpreting Studies (18 credit hours)

Select 6 courses from the following:

INTE 5050 - Topics and Practicum in Interpreting (3)
 INTE 6050 - Topics in Interpreting Studies (3)
 INTE 6172 - Spanish-English Legal Interpreting (3)
 INTE 6174 - Spanish-English Medical Interpreting (3)
 INTE 6176 - Spanish-English Community Interpreting (3)
 INTE 6601 - History, Theory, and Method of Interpreting (3)
 LANG 5050 - Topics in Foreign Language (3)
 TRAN 5050 - Topics in Translation Practica (3)
 TRAN 6000 - Special Topics in Translation Studies (3)
 TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)
 TRAN 6474 - Workshop on Non-Literary Topics II (Medical and Technical) (3)
 TRAN 6476 - Workshop on Literary and Cultural Topics (3)
 TRAN 6480 - Translation Internship (1 to 6) (*up to 3 credit hours may be applied toward the degree*)
 TRAN 6601 - History, Theory, and Method of Translation (3)
 TRAN 6602 - Linguistics for Translators (3)
 TRAN 6603 - Computer-Assisted Translating (3)
 TRAN 6604 - Translation Project Management (3)
 TRAN 6901 - Advanced Project in English↔Spanish Translating (1 to 3)

Electives Courses or Thesis Option (6 credit hours)

Select either 6 credit hours of electives or 6 credit hours of TRAN 6902 (Thesis).

Elective Courses (6 credit hours)

Select two courses from the following:

INTE 5050 - Topics and Practicum in Interpreting (3)
 INTE 6050 - Topics in Interpreting Studies (3)
 INTE 6172 - Spanish-English Legal Interpreting (3)
 INTE 6174 - Spanish-English Medical Interpreting (3)
 INTE 6176 - Spanish-English Community Interpreting (3)
 INTE 6601 - History, Theory, and Method of Interpreting (3)
 LANG 5050 - Topics in Foreign Language (3)
 SPAN 5011 - Studies in Spanish American Prose Fiction (3)
 SPAN 5050 - Selected Topics in Spanish (1 to 3)

SPAN 5120 - Advanced Business Spanish I (3)
 SPAN 5121 - Advanced Business Spanish II (3)
 SPAN 5202 - Twentieth Century Spanish Literature (3)
 SPAN 5205 - Novel of the Golden Age (3)
 SPAN 5210 - Studies in Spanish American Poetry (3)
 SPAN 5212 - Studies in Spanish American Theater (3)
 SPAN 5213 - Cervantes (3)
 SPAN 5410 - Professional Internship in Spanish (1 to 6) (*Up to 3 credit hours may be applied toward the degree.*)
 SPAN 6001 - Advanced Studies in Spanish Language (3)
 SPAN 6003 - Studies in Hispanic Culture and Civilization (3)
 SPAN 6005 - Advanced Studies in Spanish Literature (3)
 SPAN 6007 - Advanced Studies in Spanish American Literature (3)
 SPAN 6201 - Hispanic Language and Culture through Media (3)
 TRAN 6000 - Special Topics in Translation Studies (3)
 TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)
 TRAN 6474 - Workshop on Non-Literary Topics II (Medical and Technical) (3)
 TRAN 6476 - Workshop on Literary and Cultural Topics (3)
 TRAN 6480 - Translation Internship (1 to 6) (*Up to 3 credit hours may be applied toward the degree.*)
 TRAN 6601 - History, Theory, and Method of Translation (3)
 TRAN 6602 - Linguistics for Translators (3)
 TRAN 6603 - Computer-Assisted Translating (3)
 TRAN 6604 - Translation Project Management (3)
 TRAN 6901 - Advanced Project in English↔Spanish Translating (1 to 3)

Thesis (6 credit hours)

The master's thesis may include the history, theory, and method of translation or interpreting; linguistics for translators; translation project management and technologies; and the analysis and translation of different types of texts and discourse: business, technical, medical, legal, scholarly, and literary.

TRAN 6902 - Thesis (1 to 6)

Degree Total = 30 Credit Hours

Advising

Graduate students are advised by the Graduate Program Director and by designated graduate faculty members in good standing.

Comprehensive Examination

After Admission to Candidacy, students must successfully complete a comprehensive examination. Students must be enrolled during the semester in which they take the comprehensive examination, which is usually taken during their final semester of enrollment in the program. The exams are scheduled twice a year: usually in mid to late November of each Fall semester and in mid to late April of

each Spring semester.

Application for Degree

Students should apply for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Assistantships

A limited number of graduate assistantships are available on a competitive basis each year. Applications must be received no later than April 15 for assistantships beginning the following academic year. Further information is available in the Department of Languages, Cultures, and Translation.

Internships

The Department approves a limited number of internships (SPAN 5410 and TRAN 6480) which provide program-related experience for graduate students who seek to develop their Spanish skills in a professional setting. Further information is available in the Department of Languages, Cultures, and Translation.

Licensure

Students seeking licensure in Spanish should obtain information on requirements from the Office of Teacher Education Advising and Licensure (TEAL) in the College of Education.

Tuition Waivers

A limited number of in-state as well as out-of-state tuition waivers may be available for new graduate assistants and/or outstanding applicants.

Graduate Certificate in LANG: Business Languages

The Department of Languages, Cultures, and Translation offers a Graduate Certificate in LANG: Business Language with a concentration in Spanish. It is designed for Early Entry, post-baccalaureate, graduate, and post-graduate students. Students typically complete the required 12 graduate credit hours in 2-3 semesters, and may begin the program in either the Fall or Spring semester.

Students in the certificate program pursue advanced study of language, culture, and intercultural communication in business Spanish, which involves intensive development of speaking, listening comprehension, reading, writing, translation, and interpreting skills focused on topics such as business communications, economics, management, banking, real estate, office systems, marketing (logistics and advertising), finance, import-export, and e-commerce.

Graduate level coursework may also include 6 credit hours of special topics courses in business language studies, graduate courses in Spanish, related coursework from another graduate program such as Latin American Studies or International Business, and up to 3 credit hours of professional internship credit in an appropriate intercultural communication or target-language business setting.

Admission Requirements

Students must apply for admission to the Graduate School and must have a minimum undergraduate GPA of 2.75. Applicants will generally have a baccalaureate degree in Spanish, or in a closely related area that requires sufficient upper-division coursework in that language (e.g., for Spanish: Latin American Studies, International Studies, International Business), or an Undergraduate Certificate or Minor in Spanish.

Applicants are required to submit:

- A well-developed essay in English that addresses the applicant's motivation for enrolling in the Graduate Certificate
- Two letters of reference (typically from professors, intercultural communications specialists in language or business, and/or employers, preferably in a business field)
- Official scores on the Test of English as a Foreign Language (TOEFL) (International Students only)

Notes: Applicants may be required to have an interview with the Graduate Director. Students interested in adding this Graduate Certificate to the M.A. in Spanish must apply separately for the certificate program; one application does not cover both programs. Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the Undergraduate Catalog for details and requirements. Also see the Degree Requirements and Academic Policies section of the Graduate Catalog for more information about Early Entry Programs.

Certificate Requirements

Elective Courses (6 credit hours)

Select two of the following:

- ECON 5172 - Economics of International Finance (3)
- INTE 5050 - Topics and Practicum in Interpreting (3)
- INTE 6050 - Topics in Interpreting Studies (3)
- INTE 6172 - Spanish-English Legal Interpreting (3)
- INTE 6176 - Spanish-English Community Interpreting (3)
- INTE 6601 - History, Theory, and Method of Interpreting (3)

LTAM 5000 - Graduate Topics in Latin American Studies (3)

LTAM 5600 - Seminar in Latin American Studies (3)

LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3)

LTAM 6100 - Seminar in Latin American Politics (3)

LTAM 6252 - Seminar in Modern Latin American History (3)

LTAM 6300 - Seminar in Latin American Thought (3)

MBAD 6161 - Human Behavior in Organizations (0 to 3)

MBAD 6194 - Global Strategic Management (0 to 3)

MBAD 6270 - Marketing Management (0 to 3)

MSMG 6120 - Management and Organizational Behavior (3)

MSMG 6130 - Economics for Managers (3)

MSMG 6160 - Marketing from a Management Perspective (3)

MSMG 6190 - Managerial Ethics and Leadership (3)

SPAN 5050 - Selected Topics in Spanish (1 to 3)

SPAN 5410 - Professional Internship in Spanish (1 to 6)

SPAN 5800 - Directed Individual Study (1 to 3)

SPAN 6001 - Advanced Studies in Spanish Language (3)

SPAN 6003 - Studies in Hispanic Culture and Civilization (3)

SPAN 6201 - Hispanic Language and Culture through Media (3)

TRAN 5050 - Topics in Translation Practica (3)

TRAN 6000 - Special Topics in Translation Studies (3)

TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)

TRAN 6601 - History, Theory, and Method of Translation (3)

TRAN 6602 - Linguistics for Translators (3)

TRAN 6603 - Computer-Assisted Translating (3)

TRAN 6604 - Translation Project Management (3)

Concentration in Spanish

Core Courses (6 credit hours)

SPAN 5120 - Advanced Business Spanish I (3)

SPAN 5121 - Advanced Business Spanish II (3)

Elective Courses (6 credit hours)

Select two of the following:

SPAN 5050 - Selected Topics in Spanish (1 to 3)

SPAN 5410 - Professional Internship in Spanish (1 to 6)

SPAN 5800 - Directed Individual Study (1 to 3)

SPAN 6001 - Advanced Studies in Spanish Language (3)

SPAN 6003 - Studies in Hispanic Culture and Civilization (3)

SPAN 6201 - Hispanic Language and Culture through Media (3)

INTE 5050 - Topics and Practicum in Interpreting (3)

INTE 6050 - Topics in Interpreting Studies (3)

INTE 6176 - Spanish-English Community Interpreting (3)

INTE 6601 - History, Theory, and Method of Interpreting (3)

TRAN 5050 - Topics in Translation Practica (3)

TRAN 6000 - Special Topics in Translation Studies (3)

TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)

TRAN 6601 - History, Theory, and Method of Translation (3)

TRAN 6602 - Linguistics for Translators (3)

TRAN 6603 - Computer-Assisted Translating (3)

TRAN 6604 - Translation Project Management (3)

ECON 5172 - Economics of International Finance (3)

LTAM 5000 - Graduate Topics in Latin American Studies (3)

LTAM 5600 - Seminar in Latin American Studies (3)

LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3)

LTAM 6100 - Seminar in Latin American Politics (3)

LTAM 6252 - Seminar in Modern Latin American History (3)

LTAM 6300 - Seminar in Latin American Thought (3)

MBAD 6161 - Human Behavior in Organizations (3)

MBAD 6194 - Global Strategic Management (3)

MBAD 6270 - Marketing Management (3)

MSMG 6120 - Management and Organizational Behavior (3)

MSMG 6130 - Economics for Managers (3)

MSMG 6160 - Marketing from a Management Perspective (3)

MSMG 6190 - Managerial Ethics and Leadership (3)

Certificate Total = 12 Credit Hours

Grade Requirements

The Graduate Certificate in LANG: Business Language is earned by completion of 12 credit hours of graduate coursework (4 courses) with a grade of B or above in each course.

Transfer Credit

Generally, only graduate courses taken at UNC Charlotte count toward the Graduate Certificate. However, 3 credit hours of coursework may be considered for possible transfer into the certificate program if approved by the Department of Languages, Cultures, and Translation; and 9 of the 12 credit hours for the Graduate Certificate must be taken in residency.

Graduate Certificate in LANG: Translating

The Department of Languages, Cultures, and Translation offers a Graduate Certificate in LANG: Translating with options in the following language pairs: English-French, English-German, English-Japanese, and English-Spanish. It is designed for Early Entry, post-baccalaureate, graduate, and post-graduate students. Students typically complete the required 12 graduate credit hours in 2-3 semesters, and may begin the program in either the Fall or Spring semester.

Students in the certificate program study the history, theory, methodology, and profession of translation; work intensively in the analysis and translation of different types of discourse, including non-literary and literary texts; become familiar with computer-assisted translation; and develop advanced post-editing skills. Graduate level coursework may also include special topics courses in translation and up to 3 credit hours of professional internship credit in translating. Translating is done in both directions of a given language pair:

- English ↔ French
- English ↔ German
- English ↔ Japanese
- English ↔ Spanish

Admission Requirements

Students must apply for admission to the Graduate School and must have a minimum undergraduate GPA of 2.75. Applicants will generally have a baccalaureate degree in one of the certificate languages: French, German, Japanese, Russian, or Spanish, or in a closely related area that requires sufficient upper-division coursework in that language (e.g., for Spanish, Latin American Studies, International Studies, International Business), or an undergraduate degree, certificate, or minor in translation.

Applicants are required to submit:

- A well-developed essay in English that addresses the applicant's motivation for enrolling in the Graduate Certificate
- Three letters of reference (from professors, specialists in translation, and/or employers, preferably in the field)
- An oral interview with the Graduate Program Director
- A sample of translations into or from the language pair selected (with original text to accompany each translation submitted)
- Official scores on the Test of English as a Foreign Language (TOEFL) (*International Students only*)

Notes: Students interested in adding this Graduate Certificate to the M.A. in Spanish must apply separately for the certificate program. One application does not cover both programs. Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Certificate Requirements**Core Courses (6 credit hours)***Select two of the following:*

- LANG 5050 - Topics in Foreign Language (3)
- TRAN 5050 - Topics in Translation Practica (3)
- TRAN 6000 - Special Topics in Translation Studies (3)
- TRAN 6601 - History, Theory, and Method of Translation (3)
- TRAN 6602 - Linguistics for Translators (3)
- TRAN 6603 - Translating and the Computer (3)
- TRAN 6604 - Translation Project Management (3)

Language-Specific Translation Courses (6 credit hours)

Select courses from the language being studied. With permission of the department, students may substitute one of the Core Courses not previously taken or TRAN 6480 for three credit hours.

French*Select two of the following:*

- LANG 5050 - Topics in Foreign Language (3)
- TRAN 5050 - Topics in Translation Practica (3)
- TRAN 5402 - Practicum in Translating I – French (3)
- TRAN 5403 - Practicum in Translating II – French (3)
- TRAN 5404 - Practicum in Translating III – French (3)

German*Select two of the following:*

- LANG 5050 - Topics in Foreign Language (3)
- TRAN 5050 - Topics in Translation Practica (3)
- TRAN 5412 - Practicum in Translating I – German (3)
- TRAN 5413 - Practicum in Translating II – German (3)
- TRAN 5414 - Practicum in Translating III – German (3)

Japanese*Select two of the following:*

- LANG 5050 - Topics in Foreign Language (3)
- TRAN 5050 - Topics in Translation Practica (3)
- TRAN 5422 - Practicum in Translating I – Japanese (3)
- TRAN 5423 - Practicum in Translating II – Japanese (3)
- TRAN 5424 - Practicum in Translating III – Japanese (3)

Russian*Select two of the following:*

- LANG 5050 - Topics in Foreign Language (3)
- TRAN 5050 - Topics in Translation Practica (3)
- TRAN 5432 - Practicum in Translating I – Russian (3)
- TRAN 5433 - Practicum in Translating II – Russian (3)

Spanish*Select two of the following:*

- LANG 5050 - Topics in Foreign Language (3)
- TRAN 5050 - Topics in Translation Practica (3)
- TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)
- TRAN 6474 - Workshop on Non-Literary Topics II (Medical and Technical) (3)

TRAN 6476 - Workshop on Literary and Cultural Topics (3)

Certificate Total = 12 Credit Hours**Grade Requirements**

A grade of A or B is required for each course.

Transfer Credit

Generally, only graduate courses taken at UNC Charlotte count toward the Graduate Certificate. However, 3 credit hours of coursework may be considered for possible transfer into the certificate program if approved by the Department of Languages, Cultures, and Translation; and 9 of the 12 credit hours for the Graduate Certificate must be taken in residency.

Graduate Certificate in LANG: Translation and Interpreting Studies, Spanish-English

The Graduate Certificate in LANG: Translation and Interpreting Studies focuses on the following language pair: Spanish-English. It is designed for Early Entry, post-baccalaureate, graduate, and post-graduate students. Students typically complete the required 12 graduate credit hours in 2-3 semesters, and may begin the program in either the Fall or Spring semester.

Students in the certificate program study the history, theory, methodology, and profession of translation and interpreting; work intensively in the analysis of different types of written and oral discourse; become familiar with computer-assisted translation, sight translation, simultaneous and consecutive interpreting; and develop advanced post-editing skills. Graduate level coursework may also include special topics courses in translation and interpreting and up to 3 credit hours of professional internship credit in translating and interpreting. Translating and interpreting is done in both directions of the language pair: Spanish ↔ English.

Admission Requirements

Students must apply for admission to the Graduate School and must have a minimum undergraduate GPA of 2.75. Applicants will generally have a baccalaureate degree in Spanish, or in a closely related area that requires sufficient upper-division coursework in that language (e.g., for Spanish, Latin American Studies, International Studies, International Business), or an undergraduate degree, certificate, or minor in translation.

Applicants are required to submit:

- A well-developed essay in English that addresses the applicant's motivation for enrolling in the Graduate Certificate
- Three letters of reference (from professors, specialists in translation, and/or employers, preferably in the field)
- An oral interview with the Graduate Program Director
- A sample of translations into or from the language pair selected (with original text to accompany each translation submitted)
- Official scores on the Test of English as a Foreign Language (TOEFL) (International Students only)

Note: Students interested in adding this Graduate Certificate to the M.A. in Spanish must apply separately for the certificate program. One application does not cover both programs. Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Certificate Requirements

Core Courses (6 credit hours)

Select two of the following:

- INTE 6050 - Topics in Interpreting Studies (3)
- INTE 6601 - History, Theory, and Method of Interpreting (3)
- TRAN 6000 - Special Topics in Translation Studies (3)
- TRAN 6601 - History, Theory, and Method of Translation (3)
- TRAN 6602 - Linguistics for Translators (3)
- TRAN 6603 - Computer-Assisted Translating (3)
- TRAN 6604 - Translation Project Management (3)

Spanish-Specific Translation or Interpreting Courses (6 credit hours)

Select two of the following:

- INTE 6172 - Spanish-English Legal Interpreting (3)
- INTE 6174 - Spanish-English Medical Interpreting (3)
- INTE 6176 - Spanish-English Community Interpreting (3)
- TRAN 6472 - Workshop on Non-Literary Topics I (Business, Legal, Governmental) (3)
- TRAN 6474 - Workshop on Non-Literary Topics II (Medical and Technical) (3)
- TRAN 6476 - Workshop on Literary and Cultural Topics (3)

Note: The group of four courses selected must include a minimum of one INTE course and one TRAN course.

Grade Requirements

A grade of A or B is required for each course.

Transfer Credit

Generally, only graduate courses taken at UNC Charlotte count toward the graduate certificate. However, 3 credit hours of coursework may be considered for possible transfer into the certificate program if approved by the Department of Languages, Cultures, and Translation; and 9 of the 12 credit hours for the Graduate Certificate must be taken in residency.

Certificate Total = 12 Credit Hours

LATIN AMERICAN STUDIES

• M.A. in Latin American Studies

Graduate Program

latinamericanstudies.charlotte.edu

M.A. in Latin American Studies

The program in Latin American Studies leading to the Master of Arts degree provides students with the skills and knowledge to understand and analyze the societies of Latin America and the Caribbean—a region of key importance in the age of globalization and mass migration. The program will provide an excellent foundation for advanced graduate study in the humanities, social sciences, and law. It is also designed to prepare the growing number of students who seek careers in the foreign service and other government agencies as well as those who will seek employment in non-governmental organizations with an international or cross-cultural orientation or in international business. Finally, it will also serve as an important qualification for individuals in education and the social services who work with the burgeoning Hispanic population of North Carolina.

The M.A. program in Latin American Studies has the following educational objectives:

- To study the culture, geography, history, politics, and society of Latin America and the Spanish-speaking Caribbean
- To provide an understanding of the socio-cultural background of the Latino population in the United States
- To understand economic development and underdevelopment from a comparative perspective
- To undertake interdisciplinary research in the humanities and social sciences using a variety of methodologies
- To instill writing and critical thinking skills by teaching rigorous scholarly inquiry and research methods at a level appropriate for graduate education
- To develop language competencies in Spanish and/or Portuguese

Admission Requirements

In addition to the general requirements for admission to the Graduate School, an undergraduate degree, preferably in Latin American Studies or in a related field such as NAnthropology, Architecture, Art, Geography, History, International Business, International Studies, Political Science, Portuguese, Sociology, or Spanish, with a GPA of

at least 3.0 is required. However, the admissions committee will consider applicants with an average lower than this minimum if the other elements of the application are strong.

Spanish proficiency at the advanced level as demonstrated by undergraduate coursework, an oral interview, a standardized test, and/or life experience is also required. Knowledge of Portuguese is desirable but not required.

The following documents must be submitted for admission:

- UNC Charlotte Graduate School online application form
- Official academic transcripts
- Statement of purpose
- Evidence of proficiency in Spanish
- Three letters of recommendation on the UNC Charlotte recommendation form
- International students only: evidence of proficiency in English as well as the following UNC Charlotte forms: immigration status, statement of financial responsibility, and estimated expenses

Note: GRE scores are optional.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the *Graduate Catalog* for more information about Early Entry Programs.

Accelerated Master's Program

Academically talented high school seniors and UNC Charlotte undergraduate freshmen are encouraged to apply for the Accelerated Master's Program to begin work toward both undergraduate and graduate degrees in their Freshman year. See the *Undergraduate Catalog* for details and requirements. Also see the “Degree Requirements and Academic Policies” section of the *Graduate Catalog* for more information about Accelerated Master's Programs.

Degree Requirements

The Master of Arts degree in Latin American Studies requires completion of at least 30 credit hours in approved graduate courses. These courses must include at least 18 credit hours which are only open to graduate students. No more than 12 credit hours may be taken for credit in the degree program at the 5000 level. A maximum of 6 hours of graduate transfer credit will be accepted.

Most students complete the program in two to three years. No course listed on a master's student's candidacy form be older than six years at the time of graduation. Courses that exceed this time limit must be revalidated or retaken, whichever the graduate program decides necessary, if they are to count in a degree program.

At the end of the program, students will display Spanish proficiency at the advanced level in speaking, reading, and writing.

Tracks

Students select one of two tracks within the degree program: (1) a Thesis track or (2) an Examination track. The Thesis track prepares students for graduate work at the doctoral level in Latin American Studies or one of its constituent disciplines. The Examination track prepares students for employment in the private and public sectors.

Thesis Track (30 credit hours)

Interdisciplinary Core Courses (12 credit hours)

LTAM 5600 - Seminar in Latin American Studies (3) (two sections)

LTAM 6910 - Thesis Tutorial (3)

LTAM 6920 - Master's Thesis (3)* -

**As part of the Master's Thesis course, students prepare and defend a thesis before a committee composed of three faculty members from at least two different disciplines. A satisfactory grade (A or B) on the thesis is required for graduation.*

Multidisciplinary Elective Courses (18 credit hours)

Social Sciences Courses (6 credit hours)

Select two of the following:

LTAM 5000 - Graduate Topics in Latin American Studies (3) (science-focused topic)

LTAM 5120 - Advanced Business Spanish I (3)

LTAM 5121 - Advanced Business Spanish II (3)

LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3) (science-focused topic)

LTAM 6100 - Seminar in Latin American Politics (3)

LTAM 6800 - Directed Readings (3) (science-focused topic)

LTAM 6801 - Directed Research (3) (science-focused topic)

History Courses (6 credit hours)

Select two of the following:

LTAM 5000 - Graduate Topics in Latin American Studies (3) (history-focused topic)

LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3) (history-focused topic)

LTAM 6250 - Comparative Slavery and Race Relations (3)

LTAM 6251 - Seminar in Colonial Latin American History (3)

LTAM 6252 - Seminar in Modern Latin American History (3)

LTAM 6800 - Directed Readings (3) (history-focused topic)

LTAM 6801 - Directed Research (3) (history-focused topic)

Humanities Courses (6 credit hours)

LTAM 6300 - Seminar in Latin American Thought (3)

Plus select one of the following:

LTAM 5000 - Graduate Topics in Latin American Studies (3) (humanities-focused topic)

LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3) (humanities-focused topic)

LTAM 5310 - Studies in Spanish American Poetry (3)

LTAM 5311 - Studies in Spanish American Prose Fiction (3)

LTAM 5312 - Studies in Spanish American Theater (3)

LTAM 6300 - Seminar in Latin American Thought (3)

LTAM 6307 - Advanced Studies in Spanish American Literature (3)

LTAM 6800 - Directed Readings (3) (humanities-focused topic)

LTAM 6801 - Directed Research (3) (humanities-focused topic)

Note: - Listed above are acceptable elective courses; however, they are not limited to those listed. - Up to two of the elective courses may be independent studies (LTAM 6800 and/or LTAM 6801).

Examination Track (30 credit hours)

Interdisciplinary Core Courses (9 credit hours)

LTAM 5600 - Seminar in Latin American Studies (3) (two sections)

OR

LTAM 5600 Seminar in Latin American Studies (3) and LTAM 6400 - Internship (3)

LTAM 6950 - Comprehensive Examination (3)*

**Based on an interdisciplinary reading list of at least 40 titles, students will take a written and oral comprehensive examination before a committee composed of three faculty members from at least two different disciplines. A satisfactory grade (A or B) on the written examination is required to proceed to the oral examination; in case of an unsatisfactory grade, the written examination may be retaken once. Similarly, a satisfactory grade of A or B on the oral examination is required for graduation, and the student may retake the oral examination once in case of an unsatisfactory grade.*

Multidisciplinary Elective Courses (18 credit hours)

Social Sciences Courses (6 credit hours)

Select two of the following:

LTAM 5000 - Graduate Topics in Latin American Studies (3) (science-focused topic)

LTAM 5120 - Advanced Business Spanish I (3)

LTAM 5121 - Advanced Business Spanish II (3)

LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3) (*science-focused topic*)
 LTAM 6100 - Seminar in Latin American Politics (3)
 LTAM 6800 - Directed Readings (3) (*science-focused topic*)
 LTAM 6801 - Directed Research (3) (*science-focused topic*)

History Courses (6 credit hours)
 Select two of the following:

LTAM 5000 - Graduate Topics in Latin American Studies (3) (*history-focused topic*)
 LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3) (*history-focused topic*)
 LTAM 6250 - Comparative Slavery and Race Relations (3)
 LTAM 6251 - Seminar in Colonial Latin American History (3)
 LTAM 6252 - Seminar in Modern Latin American History (3)
 LTAM 6800 - Directed Readings (3) (*history-focused topic*)
 LTAM 6801 - Directed Research (3) (*history-focused topic*)

Humanities Courses (6 credit hours)

LTAM 6300 - Seminar in Latin American Thought (3)

Plus select one of the following:

LTAM 5000 - Graduate Topics in Latin American Studies (3) (*humanities-focused topic*)
 LTAM 6000 - Advanced Graduate Topics in Latin American Studies (3) (*humanities-focused topic*)
 LTAM 5310 - Studies in Spanish American Poetry (3)
 LTAM 5311 - Studies in Spanish American Prose Fiction (3)
 LTAM 5312 - Studies in Spanish American Theater (3)
 LTAM 6300 - Seminar in Latin American Thought (3)
 LTAM 6307 - Advanced Studies in Spanish American Literature (3)
 LTAM 6800 - Directed Readings (3) (*humanities-focused topic*)
 LTAM 6801 - Directed Research (3) (*humanities-focused topic*)

Elective Course (3 credit hours)

Select one additional course from any of the above categories.

Note: Listed above are acceptable elective courses; however, they are not limited to those listed. Up to two of the elective courses may be independent studies (LTAM 6800 and/or LTAM 6801).

Degree Total = 30 Credit Hours

Admission to Candidacy

Students are admitted to candidacy either by defending a thesis or taking a comprehensive examination.

Grade Requirements

Students must maintain a 3.0 GPA in all LTAM graduate courses to remain in and graduate from the program. As per the academic regulations of the UNC Charlotte Graduate School, one U or more than two grades of C in graduate coursework will lead to suspension in enrollment.

ORGANIZATIONAL SCIENCE

• Ph.D. in Organizational Science

Graduate Program

orgscience.charlotte.edu

Ph.D. in Organizational Science

Organizational Science is an emerging interdisciplinary field of inquiry focusing on employee and organizational health, well-being, and effectiveness. Organizational Science is both a science and a practice. Enhanced understanding leads to applications and interventions that benefit the individual, work groups, the organization, the customer, the community, and the larger society in which the organization operates. Specific topics of study in Organizational Science include, but are not limited to: *Team Processes and Performance; Organizational Structure and Effectiveness; Selection, Testing, and Promotion; Leadership; Organizational Culture and Climate; Training and Development; Performance Evaluation; Workplace Health and Safety; Workplace Diversity; Employee Attitudes; Job Satisfaction and Turnover; Rewards and Recognition; Communication Effectiveness; Technology and Work; Employee Motivation and Participation; Employee Citizenship and Deviance; Work-Life Programs; Organizations and External Environment; Customer Service and Satisfaction; Organizational Behavior; Employee Recruitment and Socialization; Interorganizational Relations; and Organizational Change.* The discipline stems from (in alphabetical order): Human Resources Management, Industrial/Organizational Psychology, Organizational Behavior, Organizational Communication, Organizational Sociology, and Social Psychology.

Upon graduation, students will have achieved the following educational objectives:

- Acquire a comprehensive and integrated body of organizational science knowledge ranging from micro

issues concerning employee selection and socialization to more macro issues concerning organizational structure and effectiveness

- Demonstrate competence in synthesizing and transcending disciplinary perspectives to generate novel, useful, and robust understandings of organizational science phenomena
- Demonstrate competence in planning, conducting, and evaluating Organizational Science research
- Demonstrate competence in teaching, communicating, and disseminating organizational science knowledge to others in an effective and pedagogically appropriate manner
- Demonstrate competence in collaborating with a diverse group of professionals, students, research participants, and consumers of organizational science services
- Demonstrate competence in applying research in organizational science to practice leading to applications and interventions that benefit the individual, the organization, the customer, and the larger community in which the organization operates

By meeting these objectives, graduates of the program will be prepared to assume leadership roles as organizational scholars, researchers, and educators in academic institutions and as practitioners and policy makers in a wide range of public and private settings. By doing so, our graduating doctoral students will be further promoting our core mission to advance employee and organizational health, well-being, and effectiveness.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, we ask students to submit the following:

- 1) A one to two-page professional statement (discuss interest in the program and objectives for pursuing this degree)
- 2) A current resume or vita
- 3) International students (whose native language is not English) must submit official test scores on the Test of English as a Foreign Language (TOEFL) of at least 550 on the written test or 220 on the computer-based test or a score of at least 85% on the Michigan English Language Assessment Battery (MELAB). All tests must have been taken within the past two years

The following are recommended admissions requirements:

- 1) Completed undergraduate degree with a GPA of 3.0 or above
- 2) Completion of statistics and research methodology courses
- 3) Research experience

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required.

Degree Requirements

Outlined below are the requirements of the Ph.D. in Organizational Science program. Additional detail on all can be found in the *Organizational Science Graduate Handbook*.

- 1) 77 credit hours (post baccalaureate) are required
- 2) Graduate students must have a 3.0 GPA in the courses on their degree plan of study in order to graduate. Two grades of C or one U will result in suspension from the program. If reinstated, another grade of C or U will result in termination from the program.
- 3) Students who have taken graduate coursework but have not earned graduate degrees may transfer in up to six credit hours of coursework. Students who have earned master's degrees may transfer up to thirty credit hours
- 4) Beyond the 30 hours that students with a Master's degree can transfer into the program, all coursework that will count toward the Ph.D. will be 6000-level or above. The majority of the coursework will be at the 8000 level
- 5) Master's thesis or Independent Pre-Doctoral Research Project is required
- 6) A qualifying exam is required. Failure to pass the qualifying examination after two attempts will result in termination from the program
- 7) A Dissertation is required
- 8) An organizational science practicum is optional
- 9) Each year, a student will have a performance appraisal assessment
- 10) A student may choose a disciplinary "emphasis" (e.g., an emphasis in Business, Sociology, Psychology, or Communication Studies). An emphasis includes three discipline-specific courses. A disciplinary emphasis would provide an opportunity for a student to combine interdisciplinary training with a core disciplinary specialization. Students preparing for careers in academia may benefit most from having such an emphasis. Students may choose to not have an "emphasis" and instead take electives that span across all disciplines. Program director approval is needed in order to count a course toward an emphasis
- 11) A student can consider co-enrolling in other MA programs at UNC Charlotte
- 12) Students must complete their degree, including dissertation, within nine years

Curriculum

The curriculum has three major curricular components: (1) Core Organizational Science and Research, (2)

Electives/Advanced Seminars, and (3) Dissertation Research.

Core Organizational Science and Research Courses (41 credit hours)

OSCI 8000 - Organizational Science Overview (3)
 OSCI 8001 - Current Topics and Events in Organizational Science (1) (*7 required; if OS Overview does not include a lab, 8 credit hours will be required*)
 OSCI 8100 - Organizational Science Lab (1-2)
 OSCI 8102 - Research Methodologies in Behavioral Sciences (3)
 OSCI 8103 - Basic Quantitative Analyses for Behavioral Sciences (3)
 OSCI 8206 - Qualitative Research Methods (3)
 OSCI 8208 - Advanced Qualitative Data Analysis (3)
 OSCI 8610 - Micro Organizational Science I (3)
 OSCI 8611 - Macro Organizational Science I (3)
 OSCI 8620 - Micro Organizational Science II - (3)
 OSCI 8621 - Macro Organizational Science II - (3)
 OSCI 8948 - Independent Pre-Doctoral Organizational Science Research Project I (3)
 OSCI 8949 - Independent Pre-Doctoral Organizational Science Research Project II (3)

Elective Courses (18 credit hours)

Select from the following:

OSCI 8003 - Writing and Publishing in Organizational Science (1 to 3)
 OSCI 8130 - Social Psychology (3)
 OSCI 8477 - Organizational Science Practicum (1 to 6) (*maximum of 3 credit hours unless approved by the Graduate Program Director*)
 OSCI 8630 - Micro Seminar in Organizational Science (3) (*may be repeated up to 3 times*)
 OSCI 8640 - Macro Seminar in Organizational Science (3) (*may be repeated up to 3 times*)
 OSCI 8650 - Research Methods Seminar in Organizational Science (3) (*may be repeated up to 3 times*)

Other Elective Course Options

1) Graduate courses (6000 or 8000 level) in the Departments of Communication Studies, Psychological Science, Sociology, and the College of Business can serve as elective courses. Other content (e. g., strategy, decision making) or methods (e.g., multivariate, ethnography, focus group, SEM, categorical methods) courses outside of these core disciplines of OS can also serve as elective courses upon the approval of the Director (prior to taking the class). They must be at the 6000 or 8000 level.

2) OSCI 8899 - Organizational Science Readings and Research (1 to 3) (*there is no limit on the amount of readings and research credits a student can take*)
 While 6 credit hours of readings and research will count for dissertation research, other credits of OSCI 8899 can be used for elective credits with the approval of the

Director. But, this is only granted in limited circumstances and the student should never assume credits will be counted until they consult with the Director.

Dissertation Research (18 credit hours)

Required Dissertation Research Courses

OSCI 8998 - Organizational Science Dissertation I (6)
 OSCI 8999 - Organizational Science Dissertation II (6)

Elective Dissertation Research Courses

Students may take additional credit hours of OSCI 8998 or OSCI 8999, or use up to 6 credit hours from OSCI 8899 to fulfill the remaining 6 credit hours of the 18 credit hour requirement for dissertation research.

OSCI 8998 - Organizational Science Dissertation I (6)
 OSCI 8999 - Organizational Science Dissertation II (6)
 OSCI 8899 - Organizational Science Readings and Research (1 to 3)

Degree Total = 77 Credit Hours

PSYCHOLOGY

- M.A. in Psychology
- M.A. in Industrial/Organizational Psychology

Department of Psychological Science
psych.charlotte.edu

M.A. in Psychology

The objective of the M.A. in Psychology program is to train psychologists in the knowledge and skills necessary to address problems encountered in modern living. The program provides a foundation in the research methods and content of basic psychology, as well as excellent preparation for doctoral programs in psychology. The relatively small, competitively selected student body receives individual attention from faculty members who maintain rigorous standards of academic excellence.

Note: Clinical training is not provided at the master's level. For clinical training at the doctoral level, please see the Ph.D. in Health Psychology program.

The M.A. program offers optional areas of emphasis: Community Psychology, Cognition, and Health Psychology (Health Psychology is available only for co-enrolled Ph.D. in Health Psychology students). Other focus areas can be considered with the backing of a faculty member. Applicants are encouraged to check with faculty in their area of interest to determine if they would be open to serving as their research advisors.

- For students interested in training in Community Psychology, read about community psychology and the award-winning program online at healthpsych.charlotte.edu/concentration-areas/community
- Information on Cognitive Science can be found online at cognisci.charlotte.edu

Applicants should check with faculty in those areas to determine if they would be open to serving as their research advisors. Without a faculty member who is willing to commit to serving as a research advisor for an applicant, the likelihood of being admitted to the program is very low.

Admission Requirements

Admission to the graduate program for Psychology is very competitive, with many students applying for the program.

Students with the strongest qualifications are selected. Application deadline for M.A. in Psychology is February 1. Late admit deadline is April 1. Please note: there are seldom positions available for students who submit late admit applications.

Students are admitted only for Fall semester. Application materials and instructions can be found on the Graduate Admissions website.

Undergraduate Work

- Minimum 3.0 GPA overall
- Minimum 3.0 GPA in psychology courses
- 18 credit hours of undergraduate psychology courses, including Introductory Psychology and Research Methods
- An undergraduate course in statistics

Additional Requirements

To be considered for admission, a student must present the following requirements in addition to those required by the Graduate School:

- Completed application by February 1
- An agreement with a member of the faculty in the Department of Psychological Science who will supervise the student's research

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are not required.

Degree Requirements

The program requires at least 30 credit hours of graduate coursework. Full-time students should be able to complete the program in two calendar years. All courses must be pre-approved by the student's advisory committee. Hours beyond the 30 credit hours may be required by the academic advisor and student's advisory committee.

During the first semester the student, with the agreement of the advisor (who must be a member of the Psychological Sciences faculty), must form a three-person advisory committee. At least one member of this committee must be on the faculty of the Department of Psychological Sciences. The members of the advisory committee may or may not be the same as members of the thesis committee.

The student, along with their committee, should draft a plan indicating which courses they anticipate taking, as well as a proposed sequence and a timeframe. Included should also be a timeframe to meet the milestones for the program (thesis proposal and defense), recognizing that some courses have prerequisites.

Students are expected to engage in research with their advisor throughout the program. A thesis is required.

Core Courses (18 credit hours)**Methodology Courses (6 credit hours)***Community Courses*

PSYC 6145 - Applied Research Design and Program Evaluation (3)

PSYC 6205 - Field and Lab Based Quantitative Research Methods (3)

Courses in research methods approved by the student's advisory or thesis committee

Cognition Courses

OSCI 8650 - Research Methods Seminar in Organizational Science (3)

PSYC 6205 - Field and Lab Based Quantitative Research Methods (3)

PSYC 6650 - Research Methods Seminar in Organizational Science (3)

RSCH 6110 - Descriptive and Inferential Statistics (3)

RSCH 6120 - Advanced Statistics (3)

Courses in research methods approved by the student's advisory or thesis committee

Health Courses

These courses are available only for students currently enrolled in the Ph.D. in Health Psychology program.

HPSY 8102 - Research Design and Quantitative Methods in Psychology (3)

HPSY 8103 - Basic Quantitative Analyses for Behavioral Sciences (3)

Ethics Courses (3 credit hours)*Select one of the following:*

PSYC 6107 - Ethical and Professional Issues in Psychology (3)

HPSY 8107 - Ethical and Professional Issues in Psychology (3)

PHIL 6240 - Research Ethics in the Biological and Behavioral Sciences (3)

PHIL 8240 - Research Ethics in the Biological and Behavioral Sciences (3)

Specialty Area Courses (6 credit hours)*Community Courses*

PSYC 6155 - Community Psychology (3)

PSYC 6455 - Practicum in Community Psychology (1 to 3)

*Cognition Courses**Select two of the following:*

PSYC 5316 - Cognitive Neuroscience (3)

PSYC 6115 - Sensation and Perception (3)

PSYC 6116 - Cognition (3)

Health Courses

These courses are available only for students currently enrolled in the Ph.D. in Health Psychology program.

HPSY 8200 - Health Psychology I (3)

HPSY 8201 - Health Psychology II (3)

Thesis Course (1 to 3 credit hours)

PSYC 6999 - Thesis (1 to 3)

Thesis committees shall have at least 3 members. At least one member should be a member of the psychology faculty. The committee must be approved by the student's advisor and the program director. After submitting the formal written proposal to the committee, a proposal defense will be scheduled. Approval of the thesis proposal by the committee must be unanimous. Following a successful proposal, the student shall execute the study, write and submit the complete thesis to the committee. An oral defense in front of the committee shall then be scheduled. Approval of the completed thesis by the committee must be unanimous.

Elective Courses (12 credit hours)

A minimum of 12 elective credit hours selected in consultation with the student's advisory committee is required. Available elective courses include all Psychology (PSYC) graduate courses and the following courses from other departments:

COMM 6000 - Topics in Communication Studies (3)

ENGL 5167 - The Mind and Language (3)

ENGL 6161 - Introduction to Linguistics (3)

ENGL 6163 - Understanding Language Learning: Mind, Identity, and the Sociocultural World (3)

GEOG 5110 - Geographic Information Systems for Non-Majors (3)

GEOG 6005 - Topics in Earth and Environmental Systems (3)

GRNT 6210 - Aging and Public Policy (3)

GRNT 6600 - Current Issues in Aging (3)

HLTH 6202 - Community Epidemiology (3)

HLTH 6220 - Applied Health Behavior Change (3)

HLTH 6227 - Community Health Planning and Evaluation (3)

HLTH 6228 - Social Determinants of Health (3)

HSRD 8000 - Topics in Health Services Research (1 to 4)

HSRD 8202 - Healthcare Systems and Delivery (3)

HSRD 8203 - Economics of Health and Healthcare (3)

ITCS 6050 - Topics in Intelligent Systems (3)

ITCS 6150 - Intelligent Systems (3)

ITIS 6400 - Human-Centered Design (3)

KNES 5232 - Physiology of Human Aging (3)

KNES 6285 - Advanced Cardiopulmonary Physiology (3)

MPAD 6142 - Grant Writing and Reporting (3)

MPAD 6184 - Urban Government and Politics (3)

MPAD 6210 - Aging and Public Policy (3)

MPAD 6311 - Introduction to Nonprofit Management (3)

MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)

NURS 6115 - Health Policy and Planning in the U.S. (3)

OSCI 8650 - Research Methods Seminar in Organizational Science (3)
 PHIL 6050 - Topics in Philosophy (1 to 3)
 PHIL 6240 - Research Ethics in the Biological and Behavioral Sciences (3)
 PHIL 6340 - Philosophy of Mind (3)
 PHIL 8240 - Research Ethics in the Biological and Behavioral Sciences (3)
 PPOL 8661 - Social Organization of Healthcare (3)
 PPOL 8663 - Health Policy (3)
 PPOL 8667 - Economic of Health and Healthcare (3)

Degree Total = 30 Credit Hours

Grade Requirements

Hours beyond the required 30 credit hours of graduate course work may be required by the academic advisor and the student's advisory committee. The faculty conduct a thorough review of student performance on a regular basis. Continuation in the program is contingent upon a favorable review during these evaluations. Students who consistently show borderline course performance, who fail to complete coursework in a timely basis, or who otherwise perform unprofessionally or unsatisfactorily, may be required to complete additional courses or may be removed from the program. The enrollment of a student who receives three grades of C or one Unsatisfactory (U) grade during his or her graduate career is automatically terminated.

Assistantships

A variety of resources are available for financial assistance. These include teaching assistantships, research assistantships from faculty grants, and graduate assistantships in other campus units such as the Learning Center and Disability Student Services.

Research Experiences

Students are required to become involved in ongoing research in the department, and they are required to complete a thesis.

M.A. in Industrial/Organizational Psychology

The objective of UNC Charlotte's nationally recognized master's degree program in Industrial/Organizational (I/O) Psychology is to provide students with the knowledge and skills necessary to improve the world of work for both employees and organizations. The program provides foundations in core I/O topics in the context of science-driven practice. Specifically, students are provided with a strong foundation in (a) reading, understanding and applying the science of I/O Psychology to solve organizational problems and (b) collecting, critically

evaluating, and statistically examining data to support organizational decision-making. Students receive individual attention from faculty members who maintain rigorous standards of academic excellence.

The program is designed to be accessible for working professionals. Courses are offered in the evenings and on weekends so that individuals who work full-time can complete the program. The program is ideal for people working in an I/O-related field, such as in a Human Resources function within an organization, who are looking for a degree that will allow them to expand their career options. The program is also appropriate for working individuals looking to change careers and for individuals who have just completed an undergraduate degree. Work in an I/O-related career is not required for admittance into the program.

An Advisory Board has been established for the I/O Program. The Board, made up of leading I/O psychologists and human resource professionals working in the Charlotte Community (see the department website for a list of current Board members), provides regular reviews and evaluations of the programs' curriculum to ensure that course content addresses current topics and issues facing I/O psychologists working in the business community. The Board also plays a key role in identifying business leaders in the community who can provide information or guidance to students.

Admission Requirements

- **Letters of Recommendation** - Two letters of recommendation are required. Working professionals who received a bachelor's degree more than five years ago are suggested to seek out recommenders who can speak to their capabilities and potential as an I/O or HR professional (e.g., supervisors). Applicants who have recently graduated from a bachelor's program should seek out academic recommenders who can speak to their potential for graduate studies.
- **Statement of Purpose** - Three essay responses to specific questions are required. Please see the program's webpage (<https://psych.charlotte.edu/node/157/>) for the three questions and instructions. Each essay must be limited to one page, double-spaced (three pages total with all answers combined).
- **Degree** - Applicants must also have a bachelor's degree from a college or university accredited by an accepted accrediting body (the Graduate School requires that applicants upload transcripts from each institution attended). While a degree in psychology or business is not required, applicants with backgrounds in these disciplines may be given preferential treatment.

Admission to the program is competitive. Applicants whose native language is other than English must offer acceptable scores on the Test of English as a Foreign Language (see graduateschool.charlotte.edu for what constitutes an acceptable score). Applications should be submitted by February 15 of years that applications are accepted (applications are accepted on an every other year basis in even years - e.g., 2026; 2028).

Degree Requirements

A minimum of 31 credit hours of graduate coursework is required. Courses will be required during the Summer Session between the first and second year in the program. Additional details about these requirements can be found in the *I/O Psychology Graduate Student Handbook*.

Core Courses (30 credit hours)

PSYC 6102 - Organizational Research Methods (3)
or OSCI 8102 - Research Methodologies in Behavioral Sciences (3)
PSYC 6171 - Industrial/Organizational Psychology (3)
or OSCI 8000 - Organizational Science Overview (3)
PSYC 6172 - Talent Acquisition (3)
or OSCI 8610 - Micro Organizational Science I (3)
PSYC 6173 - Job Attitudes (3)
or OSCI 8611 - Macro Organizational Science I (3)
PSYC 6175 - Organizational Development and Change (3)
or OSCI 8621 - Macro Organizational Science II (3)
PSYC 6177 - Talent Management (3)
or OSCI 8620 - Micro Organizational Science II (3)
PSYC 6205 - Field and Lab Based Quantitative Research Methods (3)
or OSCI 8103 - Basic Quantitative Analyses for Behavioral Sciences (3)
PSYC 6207 - Measurement in Organizations (3)
or OSCI 8630 - Micro Seminar in Organizational Science (3)
PSYC 6630 - Topics in Talent Management (3)
or OSCI 8206 - Qualitative Research Methods (3)
PSYC 6640 - Topics in Organizational Psychology (3)
or OSCI 8640 - Macro Seminar in Organizational Science (3)

Specialization Tracks (1 or 6 credit hours)

Students select a specialization track: (1) a thesis research track or (2) a practice track. These tracks allow the student to tailor, in part, their educational experience to their career objectives. The only difference between the tracks is the capstone experience. A complete description of the specialization tracks and requirements (including a thorough discussion of the comprehensive exam) can be found in the most recent version of the *I/O Psychology Graduate Student Handbook*.

Thesis Research Track Option (6 credit hours)

Students choosing the thesis track defend an empirical thesis and take the following:

PSYC 6999 - Thesis (1 to 3) (*taken for 6 credit hours if completing the empirical thesis*)

OR

OSCI 8948 - Independent Pre-Doctoral Organizational Science Research Project I (3)
and OSCI 8949 - Independent Pre-Doctoral Organizational Science Research Project II (3)

Practice Track Option (1 credit hour)

Students choosing the practice track complete a standardized comprehensive examination in the summer of year two in the program and take the following course. The examination samples content from across the I/O Psychology discipline.

PSYC 6899 - Readings and Research in Psychology (1 to 4) (*taken for 1 credit hour if taking the comprehensive exam*)

Additional Requirements

All PSYC courses in the Industrial/Organizational Psychology curriculum may be taken only with permission of the Department of Psychological Science or course instructor. Access to registration for these courses is only by permission of the Department of Psychological Science or course instructor.

Students enrolled in both the M.A. in Industrial/Organizational Psychology program and the Ph.D. in Organizational Science program must meet additional requirements. The student must choose a thesis chair or co-chair who is an I/O Psychology faculty member or I/O program affiliated faculty member as listed on the website.

Degree Total = 31-36 Credit Hours

Grade Requirements

Students who receive two grades of C or one Unsatisfactory (U) grade during their graduate career are automatically terminated from the program.

Students must complete either a comprehensive examination or orally defend a thesis project. Failure to pass the qualifying exam or the oral defense after two attempts will result in termination from the program.

PUBLIC ADMINISTRATION

- The Gerald G. Fox Master of Public Administration (MPA)
 - Arts Administration
 - Emergency Management
 - Nonprofit Management
 - Public Finance
 - Urban Management and Policy
- Graduate Certificate in Emergency Management
- Graduate Certificate in Nonprofit Management
- Graduate Certificate in Public Budgeting and Finance
- Graduate Certificate in Urban Management and Policy

Department of Political Science and Public Administration
mpa.charlotte.edu

Master of Public Administration (MPA)

The primary objective of the Gerald G. Fox Master of Public Administration (MPA) degree program is to provide professional training in public administration. The curriculum of this National Association of Schools of Public Affairs and Administration (NASPAA) accredited program emphasizes the analysis of the political and administrative environments as well as the administrative decision-making approaches of public administration. Application of techniques and administrative skills to the management of nonprofit organizations is also included in the curriculum. The methods of instruction employed in the program expose students to a variety of approaches to public management.

Students may enroll in the Master of Public Administration program on either a full-time or part-time basis. The majority of classes are scheduled in the evening throughout the year. Classes meet on the main University campus and at UNC Charlotte Center City.

Admission Requirements

Admission to the Master of Public Administration program is open to qualified graduates of a college or university accredited by an accepted accrediting body. There are seven major requirements for admission:

- 1) Application submitted online to the Graduate Admissions Office, accompanied by the application fee, which is neither deductible nor refundable
- 2) Possession of a bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body
- 3) An undergraduate grade point average of at least 3.0 on a 4.0 scale
- 4) A written statement of professional career goals and a description of any significant work experience, particularly in the public or nonprofit sectors
- 5) Three supporting letters of recommendation from professors or employers
- 6) Submission of two official transcripts from all postsecondary educational institutions in which the candidate was enrolled

Prerequisite Requirements

In addition to the admission requirements, MPA students must:

- Complete STAT 1222 (Elementary Statistics for the Social Sciences) or its equivalent with a grade of C or above
- Complete, POLS 1110 (Introduction to American Government) or its equivalent with a grade of C or above must be completed prior to taking MPAD 6102
- Demonstrate proficiency in computer applications (e.g., ability to use Microsoft Word, Excel, and PowerPoint) prior to taking MPAD 6126

Students may complete these after admission into the program.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Master of Public Administration program is structured in three distinct phases: 1) Core, 2) Advanced Work, and 3) directed Study Or Research Project. In all, the program requires 39 hours of graduate credit for completion of the degree. The *MPA Program Handbook*, available online at

mpa.charlotte.edu, presents the most up-to-date listing of degree requirements.

Core Courses (18 credit hours)

All students are required to complete 18 credit hours in core study. The emphasis in the core is twofold: (a) Understanding the various managerial and analytical approaches salient to the environment of public administration, and (b) Achieving an overall perspective on the problems of public administration. Students must attain a grade of B or above in each core course prior to enrolling in MPAD 6187 and MPAD 6188. Students earning grades of C in a core course must retake that course at the earliest possible opportunity. The core courses are:

MPAD 6102 Foundations in Public Administration (3)
 MPAD 6104 Public Organizations and Management (3)
 MPAD 6125 Quantitative Research Methods in Public Administration (3)
 MPAD 6126 Data Analysis for Decision Making (3)
 MPAD 6131 Public Budgeting and Finance (3)
 MPAD 6134 Human Resources Management (3)

Advanced Courses

Elective Courses (12-15 credit hours)

The MPA program offers several advanced elective courses in areas important to public administrators. With the approval of the program director, students may take advanced elective work with other departments. Students are required to take a minimum of fifteen hours of advanced electives unless they opt for the Directed Study option (see below), in which case they need only take twelve hours of advanced electives. The MPA electives are:

MPAD 6000 - Topics for Graduate Study in Public Administration (1 to 4)
 MPAD 6128 - Foundations of Public Policy Analysis
 MPAD 6142 - Grant Writing and Reporting (3)
 MPAD 6143 - Introduction to Administrative Law (3)
 MPAD 6160 - Leadership in the Digital Era (3)
 MPAD 6174 - Public Policy and Politics in Healthcare Administration (3)
 MPAD 6184 - Urban Government and Politics (3)
 MPAD 6185 - Intergovernmental Relations (3)
 MPAD 6210 - Aging and Public Policy (3)
 MPAD 6211 - Administration of Aging Programs (3)
 MPAD 6290 - Emergency Management (3)
 MPAD 6291 - Homeland Security and Terrorism (3)
 MPAD 6292 - Disaster Management (3)
 MPAD 6310 - Foundations of the Nonprofit Sector (3)
 MPAD 6311 - Intro to Nonprofit Management (3)
 MPAD 6312 - Fundraising (3)
 MPAD 6314 - Marketing for Arts and Nonprofit Organizations (3)
 MPAD 6316 - Introduction to Arts Administrations (3)
 MPAD 6318 - Arts Administration II (3)

MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)
 MPAD 6326 - Applied Economics for Public Administrators (3)
 MPAD 6327 - Internal Capacity Building in Nonprofit Organizations (3)
 MPAD 6328 - Urban and Community Development (3)
 MPAD 6330 - Program Evaluation for the Public & Nonprofit Sectors (3)
 MPAD 6332 - Project Management (3)
 MPAD 6350 - Public Sector Financial Management (3)
 MPAD 6352 - Public Sector Financial Reporting and Analysis (3)
 MPAD 6820 - Independent Study (1 to 3)

Capstone Seminar (3 credit hours)

Students are required to complete the capstone course. Students must successfully complete all of their Core Courses with a grade of B or above prior to enrolling in this course.

MPAD 6187 - Advanced Seminar in Public Management Problem Solving (3)

Directed Study or Research Applications Courses

Each MPA student must complete one of the options (A or B). Students must successfully complete all of their Core Courses with a grade of B or above prior to enrolling in any courses listed in this section.

Research Applications Course

Students who select this option complete a one-semester written project course on an approved topic of significance in public administration or nonprofit management. The project includes the submission of revised paper drafts based on instructor evaluation. Students must enroll in the following course, which is graded A, B, C, or U:

MPAD 6188 - Research Applications in Public Administration (3)

Directed Study Courses

Students who select this option complete a written project on a topic of significance based on a field experience or research in public administration, nonprofit management, or arts administration. The Directed Study requires the following courses, graded on a pass/unsatisfactory basis:

MPAD 6800 - Directed Study in Public Administration (Proposal) (3)
 MPAD 6801 - Directed Study in Public Administration (Completed Study) (3)

University regulations governing the preparation and submission of Master's theses apply to the Directed Study option. Rules for the Directed Study committee are provided in the *MPA Program Handbook*. Students who

select option B may take one less elective course for 3 credit hours to complete the MPA degree in the required 39 credit hours.

Degree Concentrations

Students complete one of five approved 15 credit hour concentrations or they may develop their own program of study from elective courses. Students who choose a concentration must focus their research in MPAD 6188, or MPAD 6800 and MPAD 6801 on an approved topic related to the concentration subject matter.

Arts Administration Concentration

Prerequisite(s): For students with an undergraduate degree not in the arts: You are required to take no less than four 3-credit hour undergraduate arts courses (or the equivalent) in order to develop the necessary foundation of appreciation for the arts required of arts administrators. The exact set of courses is determined by the field of arts on which you desire to focus and in consultation with your advisor. The prerequisites vary by visual arts, dance, theater, and music. Ideally, these prerequisites are completed prior to admission into the MPA program. However, students who opt for the arts administration concentration after being admitted to the MPA program will have to complete these prerequisites prior to admission into MPAD 6187, MPAD 6188, or MPAD 6316. Substantive professional experience in the arts field can be used as a substitute or partial substitute (e.g., students may be required to take less than 4 arts courses) for the undergraduate prerequisites at the discretion of the MPA Program Director.

The Concentration in Arts Administration consists of 15 credit hours within the MPA curriculum. Students must fulfill the following requirements:

Required Courses (6 credit hours)

MPAD 6311 - Introduction to Nonprofit Management (3)
MPAD 6316 - Introduction to Arts Administration (3)

Elective Courses (9 credit hours)

Group A

Select one of the following:

MPAD 6312 - Fundraising (3)
MPAD 6314 - Marketing for Arts and Nonprofit Organizations (3)

Group B

Select one of the following:

MPAD 6128 - Foundations of Public Policy (3)
MPAD 6142 - Grant Writing and Reporting (3)
MPAD 6160 - Leadership in the Digital Era (3)
MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)
MPAD 6327 - Internal Capacity Building in Nonprofit Organizations (3)

MPAD 6318 - Arts Administration II (3)

HIST 6310 - Museum Studies (3)

ANTH 5120 - Intercultural Communications (3)

ENGL 5182 - Information Design and Digital Publishing (3)

Group C

Select one of the following:

MPAD 5xxx - Public Administration Elective (3)

MPAD 6xxx - Public Administration Elective (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Emergency Management Concentration

The Concentration in Emergency Management concentration consists of 15 credit hours within the MPA curriculum. Students must fulfill the following requirements:

Required Courses (6 credit hours)

MPAD 6290 - Emergency Management (3)

MPAD 6185 - Intergovernmental Relations

Elective Courses (9 credit hours)

Group A

Select one of the following:

MPAD 6142 - Grant Writing and Reporting (3)

MPAD 6291 - Homeland Security and Terrorism (3)

MPAD 6292 - Disaster Management (3)

GEOG 5110 - Geographic Information Systems for Non-Majors (3)

GEOG 5120 - Introduction to Geographic Information Systems (3)

Group B

Select one of the following:

MPAD 6128 - Foundations of Public Policy (3)

MPAD 6143 - Administrative Law (3)

MPAD 6160 - Leadership in the Digital Era (3)

MPAD 6184 - Urban Government and Politics (3)

MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)

MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)

MPAD 6332 - Project Management (3)

CJUS 5103 - International Criminal Justice (3)

CJUS 6132 - Legal Issues in Law Enforcement

PSYC 6155 - Community Psychology (3)

ITIS 5250 - Computer Forensics (3)

CSLG 7680 - Crisis Counseling (3)

Group C

Select one of the following:

MPAD 5xxx - Public Administration Elective (3)

MPAD 6xxx - Public Administration Elective (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Nonprofit Management Concentration

The Concentration in Nonprofit Management consists of 15 credit hours within the MPA curriculum. Students must fulfill the following requirements:

Required Courses (6 credit hours)

MPAD 6311 - Introduction to Nonprofit Management (3)
MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)

Elective Courses (9 credit hours)

Group A

Select two of the following:

MPAD 6142 - Grant Writing and Reporting (3)
MPAD 6310 - Foundations of the Nonprofit Sector (3)
MPAD 6312 - Fundraising (3)
MPAD 6314 - Marketing for Arts and Nonprofit Organizations (3)
MPAD 6316 - Introduction to Arts Administration (3)
MPAD 6318 - Arts Administration II (3)
MPAD 6327 - Internal Capacity Building in Nonprofit Organizations (3)
MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)
MPAD 6332 - Project Management (3)

Group B

Select one of the following:

MPAD 5xxx - Public Administration Elective (3)
MPAD 6xxx - Public Administration Elective (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Public Budgeting and Financial Management Concentration

The Concentration in Public Budgeting and Financial Management consists of 15 credit hours within the MPA curriculum. Students must fulfill the following requirements:

Required Courses (6 credit hours)

MPAD 6326 - Applied Economics for Public Administrators (3)
MPAD 6350 - Public Sector Financial Management (3)

Elective Courses (9 credit hours)

Select three of the following:

MPAD 6142 - Grant Writing and Reporting (3)
MPAD 6185 - Intergovernmental Relations (3)
MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)

MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)

MPAD 6332 - Project Management (3)

MPAD 6352 - Public Sector Financial Reporting and Analysis (3)

ECON 6112 - Graduate Econometrics (3)

ECON 6218 - Advanced Business and Economic Forecasting (3)

MBAD 6159 - Real Estate Development (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Urban Management and Policy Concentration

The Concentration in Urban Management and Policy consists of 15 credit hours within the MPA curriculum. Students must fulfill the following requirements:

Required Courses (6 credit hours)

MPAD 6184 - Urban Government and Politics (3)
MPAD 6185 - Intergovernmental Relations (3)

Elective Courses (9 credit hours)

Group A

Select two of the following:

MPAD 6128 - Foundations of Public Policy (3)
MPAD 6142 - Grant Writing and Reporting (3)
MPAD 6143 - Introduction to Administrative Law (3)
MPAD 6160 - Leadership in the Digital Era (3)
MPAD 6290 - Introduction to Emergency Management (3)
MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)
MPAD 6326 - Applied Economics for Public Administrators (3)
MPAD 6328 - Urban and Community Development (3)
MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)
MPAD 6332 - Project Management (3)
MPAD 6350 - Public Sector Financial Management (3)
MPAD 6352 - Public Sector Financial Reporting and Analysis (3)
GEOG 5155 - Retail Location (3)
GEOG 5110 - Geographic Information Systems for Non-Majors (3)
or GEOG 5120 - Introduction to Geographic Information Systems (3)
GEOG 5210 - Urban Planning Methods (3)
GEOG 6300 - Applied Regional Analysis (3)
GEOG 6500 - Urban Planning: Theory and Practice (3)

Group B

Select one of the following:

MPAD 5xxx - Public Administration Elective (3)
MPAD 6xxx - Public Administration Elective (3)

Note: Appropriate non-MPAD courses may be taken

within this concentration upon approval of the student's advisor and the MPA Director.

Degree Total = 39 Credit Hours

Advising

Each student is assigned an advisor and given access to the *MPA Program Handbook* when admitted to the program. The advisor is a member of the MPA Program faculty. Students should meet with their advisors each semester to develop a schedule before registering. Students are also encouraged to meet with the Program Director for additional advising when necessary.

Internships

Each student in the Master of Public Administration Program is required to complete a field experience. This requirement may be satisfied in one of these ways: (1) through a position in a public or nonprofit organization; (2) through a position in a business where the work experience is approved for internship by the MPA director; or (3) through an approved internship in a public or nonprofit organization. Each student must complete an "MPA Internship Information" form and submit it to the MPA Program office for approval. Forms to evaluate the internship experience must also be completed. These forms are available in the main MPA office. Current guidelines for the internship requirement are provided in the *MPA Program Handbook*.

Public Service Fellowships

The department works with local area government and nonprofit agencies to provide fellowships to students on a competitive basis. Host agencies employ fellows on a part-time basis (20 hours per week) for a period of one to two years. In exchange for their services, agencies pay fellows a small stipend and tuition expenses for Fall and Spring semesters.

Scholarships

- 1) The North Carolina City and County Management Association funds a scholarship for an MPA student to help train students for careers in North Carolina local government. The MPA Program selection committee nominates the eligible recipient each fall.
- 2) Burkhalter-Rassel Alumni Scholarship - the MPA Alumni Association has established a scholarship fund to honor a former Charlotte City Manager.
- 3) Brown-Dorton MPA Scholarship - the MPA selection committee nominates eligible recipients each fall.
- 4) Susan Burgess Scholarship - the MPA selection committee nominates eligible recipients
- 5) Gerald G. Fox Scholarship - the MPA selection committee nominates eligible recipients
- 6) Other awards are available on a competitive basis through the Graduate School.

- 7) Other professional associations occasionally offer scholarships for which MPA students have competed successfully.

Transfer Credit

Up to six credit hours taken at another university can be transferred to the MPA Program on the recommendation of the Director and the approval of the Dean of the Graduate School.

Graduate Certificate in Emergency Management

The Graduate Certificate in Emergency Management is designed to provide graduate education in emergency management to those individuals who are currently serving as managers in public, nonprofit, and private organizations, or those who might want to pursue a career in emergency management. The certificate is also intended to serve the interests of students enrolled in UNC Charlotte graduate programs currently. Topics of study include, but are not limited to, homeland security and terrorism, emergency prevention and response, and disaster management. The focus of the certificate is to provide the knowledge and skills necessary to manage emergency programs in the most effective, efficient, and legally sound manner.

Admission Requirements

Admission to the Graduate Certificate program in Emergency Management is open to graduates of a college or university accredited by an accepted accrediting body. To apply, the student must meet the following requirements:

- 1) A completed Graduate Admissions application form and statement of professional goals
- 2) 12 months of full-time continuous employment in a government agency, nonprofit organization, or appropriate business organization (or be currently enrolled in another graduate program). This requirement may be waived for students who already have a Master's degree.
- 3) Two official transcripts from post-secondary educational institutions
- 4) Three letters of recommendation from academic or professional sources
- 5) An overall GPA of 2.75 on a 4.0 scale

Certificate Requirements

The Graduate Certificate Program in Emergency Management requires 15 credit hours.

Core Courses (6 credit hours)

MPAD 6290 - Emergency Management (3)
MPAD 6185 - Intergovernmental Relations (3)

Elective Courses (9 credit hours)**Group A**

Select one of the following:

MPAD 6142 - Grant Writing and Reporting (3)
MPAD 6291 - Homeland Security and Terrorism (3)
MPAD 6292 - Introduction to Disaster Management (3)
GEOG 5190 - Geographic Information Systems for Non-Majors (3)

Group B

Select one of the following:

MPAD 6128 - Foundations of Public Policy (3)
MPAD 6143 - Administrative Law (3)
MPAD 6160 - Leadership in the Digital Era (3)
MPAD 6184 - Urban Government and Politics (3)
MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)
MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)
MPAD 6332 - Project Management (3)
CJUS 5103 - International Criminal Justice (3)
CJUS 6132 - Legal Issues in Law Enforcement (3)
CSLG 7680 - Crisis Counseling (3)
ITIS 5250 - Computer Forensics (3)
PSYC 6155 - Community Psychology (3)

Group C

Select one of the following:

MPAD 5xxx - Public Administration Elective (3)
MPAD 6xxx - Public Administration Elective (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Certificate Total = 15 Credit Hours

Transfer Credit

No more than three credit hours may be transferred into the certificate program from other academic institutions.

Graduate Certificate in Nonprofit Management

The Graduate Certificate in Nonprofit Management is designed to provide graduate education in nonprofit management for those individuals who are currently

serving as managers or volunteers in nonprofit organizations, or those who might want to pursue careers in nonprofit management. The certificate is also intended to serve the interests of students currently enrolled in UNC Charlotte graduate programs.

Admission Requirements

Admission to the Graduate Certificate program in Nonprofit Management is open to graduates of a college or university accredited by an accepted accrediting body. To apply, the student must meet the following requirements:

- 1) A completed Graduate Admissions application form and statement of professional goals
- 2) 12 months of full-time continuous employment in a government agency, nonprofit organization, or appropriate business organization (or be currently enrolled in another graduate program). This requirement may be waived for students who already have a Master's degree.
- 3) Two official transcripts from post-secondary educational institutions
- 4) Three letters of recommendation from academic or professional sources
- 5) An overall GPA of 3.0 on a 4.0 scale

Certificate Requirements

The Graduate Certificate in Nonprofit Management consists of 15 credit hours within the MPA curriculum.

Core Courses (6 credit hours)

MPAD 6311 - Introduction to Nonprofit Management (3)
MPAD 6324 - Financial Analysis for Government and Nonprofit Organizations (3)

Elective Courses (9 credit hours)**Group A**

Select two of the following:

MPAD 6142 - Grant Writing and Reporting (3)
MPAD 6310 - Foundations of the Nonprofit Sector (3)
MPAD 6312 - Fundraising (3)
MPAD 6314 - Marketing for the Arts and Nonprofit Organizations (3)
MPAD 6316 - Introduction to Arts Administration (3)
MPAD 6318 - Arts Administration II (3)
MPAD 6327 - Internal Capacity Building in Nonprofit Organizations (3)
MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)
MPAD 6332 - Project Management (3)

Group B

Select one of the following:

MPAD 5xxx - Public Administration Elective (3)
MPAD 6xxx - Public Administration Elective (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Certificate Total = 15 Credit Hours

Transfer Credit

No more than three credit hours may be transferred into the certificate program from other academic institutions.

Graduate Certificate in Public Budget and Finance

The Graduate Certificate in Public Budget and Finance is designed to provide graduate education in public finance to managers in public sector organizations.

Admission Requirements

Admission to the Graduate Certificate in Public Budget and Finance program is open to graduates of a college or university accredited by an accepted accrediting body. To apply, students must meet the following requirements:

- 1) A completed Graduate Admissions application form and statement of professional goals
- 2) Official transcripts from all post-secondary educational institutions
- 3) Three letters of recommendation from academic or professional sources
- 4) An overall GPA of 3.0 on a 4.0 scale

Certificate Requirements

The Graduate Certificate in Public Budget and Finance consists of 15 credit hours within the MPA curriculum.

Required Courses (9 credit hours)

MPAD 6131 - Public Budgeting and Finance (3)
 MPAD 6326 - Applied Economics for Public Administrators (3)
 MPAD 6350 - Public Sector Financial Management (3)

Elective Courses (6 credit hours)

Select two of the following:

MPAD 6142 - Grant Writing and Reporting (3)
 MBAD 6159 - Real Estate Development (3)
 MPAD 6185 - Intergovernmental Relations (3)
 MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)
 MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)
 MPAD 6332 - Program Planning (3)
 MPAD 6352 - Public Sector Financial Reporting and Analysis (3)
 ECON 6112 - Graduate Econometrics (3)

ECON 6218 - Advanced Business and Economic Forecasting (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Certificate Total = 15 Credit Hours

Transfer Credit

No more than three credit hours may be transferred into the certificate program from other academic institutions.

Graduate Certificate in Urban Management and Policy

The Graduate Certificate in Urban Management and Policy is designed to provide graduate education in urban local government to individuals who are currently serving as managers in public organizations in the Charlotte Region, or those who might want to pursue a career in local government management.

Admission Requirements

Admission to the Graduate Certificate program in Urban Management and Policy is open to graduates of a college or university accredited by an accepted accrediting body. To apply, the student must meet the following requirements:

- 1) A completed Graduate Admissions application form and statement of professional goals.
- 2) Official transcripts from all post-secondary educational institutions.
- 3) Three letters of recommendation from academic or professional sources.
- 4) An overall GPA of 3.0 on a 4.0 scale. The GPA will be weighed less heavily for students who have at least 3 years of experience working in the public or nonprofit sectors after graduating from their undergraduate programs.

Certificate Requirements

The Graduate Certificate in Urban Management and Policy consists of 15 credit hours within the MPA curriculum.

Required Courses (6 credit hours)

MPAD 6184 - Urban Government and Politics (3)
 MPAD 6185 - Intergovernmental Relations (3)

Elective Courses (9 credit hours)

Group A

Select two of the following:

MPAD 6128 - Foundations of Public Policy (3)
 MPAD 6142 - Grant Writing and Reporting (3)
 MPAD 6143 - Introduction to Administrative Law (3)
 MPAD 6160 - Leadership in the Digital Era (3)
 MPAD 6290 - Introduction to Emergency Management (3)
 MPAD 6324 - Financial Analysis for Nonprofit Organizations (3)
 MPAD 6326 - Applied Economics for Public Administrators (3)
 MPAD 6328 - Urban and Community Development (3)
 MPAD 6330 - Program Evaluation for the Public and Nonprofit Sectors (3)
 MPAD 6332 - Project Management (3)
 MPAD 6350 - Public Sector Financial Management (3)
 MPAD 6352 - Public Sector Financial Reporting and Analysis (3)
 GEOG 5155 - Retail Location (3)
 GEOG 5110 - Geographic Information Systems for Non-Majors (3)
 or GEOG 5120 - Introduction to Geographic Information Systems (3)
 GEOG 5210 - Urban Planning Methods (3)
 GEOG 6300 - Applied Regional Analysis (3)
 GEOG 6500 - Urban Planning: Theory and Practice (3)

Group B

Select one of the following:

MPAD 5xxx - Public Administration Elective (3)
 MPAD 6xxx - Public Administration Elective (3)

Note: Appropriate non-MPAD courses may be taken within this concentration upon approval of the student's advisor and the MPA Director.

Certificate Total = 15 Credit Hours

Transfer Credit

No more than three credit hours may be transferred into the certificate program from other academic institutions.

PUBLIC POLICY

- **Ph.D. in Public Policy**
 - Economic Policy
 - Environmental/Infrastructure Policy
 - Health Policy
 - Justice Policy
 - Social Policy
 - Urban and Regional Development Policy
- **Graduate Certificate in Public Policy Research and Analysis**

Graduate Program

publicpolicy.charlotte.edu

Ph.D. in Public Policy

The Ph.D. in Public Policy is an interdisciplinary program focused on the study of policy development, implementation, and evaluation. It stresses the development of skills, tools, and specialties, as well as a theoretical understanding of them, that contribute to our understanding of the structure of institutional systems and sub-systems, and of how policy should be shaped within social, economic, and political environments.

The Ph.D. in Public Policy degree program prepares students to be researchers, decision makers, and policy analysts in local, state, or federal governments, not-for-profit agencies, for-profit institutions, and academia. The program stresses applied and empirical policy research grounded in an interdisciplinary theoretical foundation. The intellectual focus of the program is guided by four overarching themes:

- 1) **Interdisciplinary Perspective:** Effective policy analysis and policy formation are not informed by any single discipline. Rather, public policy requires knowledge of the historical, cultural, political, institutional, geographic, and economic dimensions of policy problems facing any community.
- 2) **Applied and Empirical Policy Analysis:** Public policy is an inherently applied endeavor that seeks practical solutions and cogent analysis. While theory informs all research and analysis, the purpose of policy research is to elevate public discourse and improve public decision-making.
- 3) **Adaptable Analytic and Critical Thinking Skills:** Applied policy analysis requires researchers to pivot their policy focus to address constantly shifting policy priorities.
- 4) **Place-Based Research:** To exercise applied policy analysis in an interdisciplinary context, policy research must be place-based. Real policy analysis, based on

real data, applied to actual geographic and political settings is a strength of the program.

The core curriculum provides the skills needed to pursue varied policy domains, adapt to changing policy environments, and clearly communicate research results to shape policy outcomes. Students become versed in analytical techniques suitable for research and policy analysis to address substantive issues and problems in varied geographic and political contexts.

Students graduate with expertise in a specific policy field. Students have flexibility in identifying their policy field. The multidisciplinary nature of the program allows students to develop a cutting-edge policy field as they work with faculty across disciplines and colleges. Students are provided multiple opportunities to conduct guided research both within and outside of their policy field. Examples of the policy field include, but are not limited to:

- Community Development
- Economic Policy
- Economic Development Policy
- Education Policy
- Election Policy
- Energy Policy
- Environmental Policy
- Food and Nutrition Policy
- Health Policy
- Infrastructure Policy
- Justice Policy
- Peace and Conflict Policy
- Policy Process
- Political Institutions
- Social Policy
- Trade Policy
- Transportation Policy
- Urban and Regional Development

Admission Requirements

The following are general guidelines for successful admission into the Ph.D. in Public Policy degree program:

- 1) A master's degree in a social science or other field related to policy studies with a GPA of at least 3.3 is required for admission to full standing in the Ph.D. in Public Policy program.
- 2) Students with baccalaureate degrees may be admitted on a conditional basis if they have an overall undergraduate GPA of at least 3.5 and are currently enrolled in a master's level program at UNC Charlotte in a field related to policy studies. However, such students will not formally be admitted to the Ph.D. program until completion of the requirements for the master's degree.
- 3) Admission to the program requires strong scores (at least at the fiftieth percentile) on the Graduate Record Examination (GRE) or the GMAT. The GMAT/GRE can be waived if one of the following conditions are met:
 - Master's degree from a college or university accredited by an accepted accredited body with a minimum cumulative graduate GPA of 3.0, AND a minimum GPA of 3.0 in all Economics and/or Statistics courses completed at the undergraduate and/or graduate level, AND at least two years of relevant, professional work experience, OR
 - Completion of at least 9 credit hours in the UNC Charlotte Graduate Certificate in Public Policy Research and Analysis program with a minimum cumulative GPA of 3.33.
 - The waiver must be requested from the Public Policy Doctoral Director via email when submitting the completed application. Please include "PPOL GRE Waiver" in the subject line. All GRE/GMAT waivers are at the discretion of the Public Policy Doctoral Director. If candidates are unable to secure the GRE/GMAT waiver, they will be required to submit official GRE/GMAT test scores with their application.
- 4) Three strong, positive letters of recommendation, at least two of which must come from faculty in the student's previous academic programs. All letters should be written by individuals in a position to judge the applicant's likely success in a Ph.D. level program. Letters should address the applicant's suitability for a Ph.D. program and ability to complete the program in a timely fashion. Letters from the student's master's level program are preferred.
- 5) Admission to the program of students who are not native English speakers requires strong scores on the TOEFL exam. The TOEFL exam is a required part of the application package for non-native English speakers.
- 6) Students entering the program are expected to remedy any coursework deficiencies identified by the Admissions Committee and Program Director in the first semester after enrolling in the program. The amount and kinds of remedial coursework required for the program depends on the background of the student and are established by the Admissions Committee and the Program Director. Possible deficiencies are indicated in the prerequisites for the required core courses of the program. This program emphasizes the quantitative and analytical skills necessary to confront the challenges of contemporary policy dilemmas that communities face at the local, state, federal, and international levels.

Documents for Admission

- 1) Official transcripts from all colleges and universities attended
- 2) Official GRE scores (verbal, quantitative, and analytical writing) or GMAT scores (verbal, quantitative, analytical writing, and integrated reasoning).
- 3) UNC Charlotte application for graduate admission form
- 4) Three letters of reference from academics who have taught or worked directly with the applicant
- 5) An essay that addresses professional goals and motivation for pursuing the degree, suitability for the program, career goals following the degree, and potential areas of policy field the applicant would pursue within the program
- 6) TOEFL scores (if the student is not a native English speaker)

Admission Assessment

- 1) An Admissions Committee reviews applications and recommends to the Program Director whether each applicant should be admitted and, if so, under what conditions.
- 2) The program's Admissions Committee assesses each student's previous academic coursework in light of the student's stated direction of study. This assessment is used to identify the strengths and weaknesses of the student's previous academic history and to suggest specific coursework for the student's public policy program. Any remedial coursework required for the program depends on the student's background and will be established by the Admissions Committee and the Program Director. The Admissions Committee may also suggest specific coursework based on the student's intended direction of study within the program. The Admissions Committee conducts this assessment upon the student's acceptance and formal declaration of intent to attend. For each entering student, the Director of the Public Policy program serves as his or her major advisor for the first year in the program before the student chooses his or her committee chair.

Student Responsibility

Students entering the program must present evidence that their background is sufficient to undertake the coursework required of them. Such evidence ideally should include some combination of:

- 1) Familiarity with political and legal processes, behaviors, and institutions
- 2) A graduate level social science methods or statistics course
- 3) College coursework in both macro- and microeconomics
- 4) Substantial background in a public policy specialty area

Students may have completed appropriate courses to provide this background elsewhere. Normally, transcripts provide the evidence required by the Admissions Committee; however, if the student's previous experience is offered as evidence, the student must document such experience. A more detailed list of the types of prerequisite coursework can be found online at publicpolicy.charlotte.edu.

Degree Requirements

The total number of credit hours is established by the student's advisor according to a plan of study that must be presented after the successful completion of 18 credit hours of coursework. The Ph.D. program requires 29 credit hours of core course credit, at least 6 credit hours of advanced analysis coursework, 18 credit hours of dissertation credit (enrollment contingent on admission to candidacy), and a minimum of 12 credit hours for policy field courses. Students can complete the program with 65 credit hours, but will likely take more. Students progress through the program in five stages:

- 1) Core Courses
- 2) Qualifying Examinations
- 3) Advanced Analysis Coursework and Specialty Policy Field Courses
- 4) Dissertation Proposal Defense
- 5) Dissertation

Core Courses (29 credit hours)

Professional policy researchers must have a foundation of theoretical and research skills that are transferrable across policy foci. Students are provided a strong foundation in theory and methods.

Nature of the Field Courses (11 credit hours)

Professional policy researchers require a variety of tools to assess policies and develop policy recommendations. All students are required to take courses to understand the nature of the field. Students learn to critically assess the current policy literature (PPOL 8600), design a research study (PPOL 8602), and consider the ethical implications of their work (PPOL 8635). Students also take two professionalization seminars (PPOL 8690) that assist with career development and help students develop the soft skills necessary for a career in Public Policy.

PPOL 8600 - Policy Process I (3)

PPOL 8602 - Research Design in Public Policy (3)

PPOL 8635 - Ethics of Public Policy (3)

PPOL 8690 - Seminar in Public Policy (1) (*taken at least 2 semesters**)

** Students in the program develop their appreciation of the varied nature of policy applications and improve their communication skills by participating in at least two seminar series throughout the course of their program.*

Seminars also serve as a clearinghouse, introducing students to the varied faculty in the program. Students engage in activities aimed at professional development for both practitioners and for those interested in pursuing careers in academia.

Methods of Analysis Courses (12 credit hours)

Public policy researchers and scholars must have a strong foundation in research methods. All students are required to take GRAD 8101 and PPOL 8630 to develop this foundation. Students also complete two studio courses that provide hands-on research experiences. PPOL 8101 (taken before GRAD 8101) will provide hands-on experience with data management and analysis using the R statistical software package. PPOL 8102, taken after GRAD 8101, provides an opportunity for a guided research experience where students complete an independent research project under the guidance of the faculty.

GRAD 8101 - Linear Regression (3)

PPOL 8630 - Advanced Program Evaluation (3)

Economic Analysis Courses (6 credit hours)

A strong foundation in economics is critical for effective policy analysis. Students are required to take 6 credit hours in the economic analysis of public policy.

PPOL 8640 - Economic Analysis of Public Policy I (3)

PPOL 8641 - Economic Analysis of Public Policy II (3)

Advanced Analysis Courses (6 credit hours)

Advanced analytic skills prepare policy researchers to tackle a variety of complex research studies. Prior to defending a dissertation proposal, students must complete at least six (6) credit hours of advanced analysis coursework at the doctoral level. Students are encouraged to choose courses that cover the types of analysis that are prevalent in the student's policy area of interest. Students may select from the following list or take courses in other departments with permission of the Program Director. Students are strongly encouraged to take additional advanced analytic courses, as possible. Expertise in diverse methods is critical for a policy research career.

BPHD 8120 - Econometrics I (3)

BPHD 8130 - Econometrics II (3)

GRAD 8009 - Topics in Graduate Studies (3) (*topic in advanced analysis*)

GRAD 8101 - Linear Regression (3)

GRAD 8102 - Categorical Outcomes (3)

GRAD 8103 - Classificatory Methods and Time Series (3)

GRAD 8104 - Spatial Statistics (3)

PPOL 8622 - Qualitative Methods in Public Policy (3)

PPOL 8625 - Advanced Seminar in Spatial Decisions

Support Systems (3)

Policy Field Courses (12 credit hours)

The Policy Field allows students to select an area of focus that culminates in a dissertation. Students have flexibility in defining this field, in consultation with the director and the advisor. 12 credit hours are required for the policy field. Three of these credit hours must be an independent study in which students develop a reading list, in consultation with the advisor. Three of the credit hours must be a focused research experience. The final six credit hours can include any combination of an independent study, an elective PPOL course, or an elective from any graduate level program across the university with advisor or program director approval. This student-centered approach to creating the policy field allows students flexibility in identifying innovative, multidisciplinary policy expertise. This expertise is complemented by hands-on research in PPOL 8602 and 18 dissertation credit hours. Students are encouraged to take additional courses aligned with their policy field, as relevant.

Required Policy Field Courses (6 credit hours)

PPOL 8800 - Independent Study (1 to 3)

PPOL 8802 - Independent Study II: Public Policy Research Experience (3)

Elective Policy Field Courses (6 credit hours)

Students should choose two additional courses that align with their Policy Field. These courses may include elective courses from any graduate level program across the University with advisor or program director approval. This permits students flexibility in identifying innovative policy fields. Examples of courses in the Ph.D. in Public Policy program that could count toward the elective include, but are not limited to:

BPHD 8120 - Econometrics I (3)

BPHD 8130 - Econometrics II (3)

PPOL 8000 - Topics in Public Policy (1 to 4)

PPOL 8610 - The Urban Region (3)

PPOL 8611 - Metropolitan Governance and Administration (3)

PPOL 8612 - Theory of Urban Development (3)

PPOL 8613 - Transportation Policy (3)

PPOL 8615 - The Restructuring City (3)

PPOL 8616 - Urban Planning Theory and Practice (3)

PPOL 8617 - Law and Management (3)

PPOL 8622 - Qualitative Methods in Public Policy (3)

PPOL 8625 - Advanced Seminar in Spatial Decisions Support Systems (3)

PPOL 8636 - The Social Context of Mental Health (3)

PPOL 8642 - Regional Economic Development (3)

PPOL 8644 - Public Budgeting and Financing (3)

PPOL 8650 - Environmental Policy (3)

PPOL 8652 - Energy and Environmental Economics (3)

PPOL 8653 - Urban Air Quality (3)

PPOL 8661 - Social Organization of Healthcare (3)

PPOL 8663 - Health Policy (3)

PPOL 8665 - Analytic Epidemiology (3)
 PPOL 8667 - Economic of Health and Healthcare (3)
 PPOL 8669 - Investigating Health and Health Services (3)
 PPOL 8671 - Criminal Justice Policy (3)
 PPOL 8672 - Theories of Crime and Justice (3)
 PPOL 8673 - Law and Social Control (3)
 PPOL 8681 - Race, Gender, Class, and Public Policy (3)
 PPOL 8682 - Stratification and Social Policy (3)
 PPOL 8683 - Population Dynamics and Social Policy (3)
 PPOL 8685 - Aging and Social Policy (3)
 PPOL 8687 - Education Policy (3)
 PPOL 8688 - Political Economy of School Reform (3)
 PPOL 8689 - The Social Context of Schooling (3)
 PPOL 8690 - Seminar in Public Policy (1)
 PPOL 8701 - Advanced Macroeconomic Theory (3)
 PPOL 8703 - Advanced Microeconomic Theory (3)
 PPOL 8705 - Advanced Urban and Regional Economics (3)
 PPOL 8707 - Game Theory and Experiments (3)
 PPOL 8709 - Public Economics (3)
 PPOL 8711 - Monetary and Financial Theory (3)

Dissertation (18 credit hours)

The program requires that the student complete 18 hours of dissertation credit. Enrollment in dissertation credit is contingent on admission to candidacy. The dissertation topic may be proposed after the student has passed the qualifying exams. The doctoral student advances to candidacy after the dissertation proposal has been defended to, and approved by, the student's advisory committee and reported to the Director of the Ph.D. in Public Policy and the Dean of the Graduate School. The student must complete and defend the dissertation based on a research program approved by the student's dissertation committee that results in a high quality, original, and substantial piece of research.

PPOL 8801 - Dissertation (1 to 9)

Degree Total = 65 Credit Hours

Grade Requirements

A student must maintain a cumulative average of 3.0 in all coursework taken for graduate credit. An accumulation of three C grades will result in termination of the student's enrollment in the graduate program. If a student receives a grade of U in any course, enrollment in the program will be terminated.

Admission to Candidacy

After completing the core courses, students are required to write a qualifying examination covering the nature of the field, methodology, and economic analysis skills. After completing the qualifying examination, students take their policy field courses. Successful completion of core courses and the qualifying examinations allows students to proceed to the dissertation proposal preparation and defense stage. The dissertation proposal defense includes

an oral presentation and written proposal. Prior to the proposal defense, with the guidance of their advisor, students develop a topic paper that outlines the policy area on which their dissertation will focus. After a topic approval meeting, students develop that topic paper into a full proposal. During the oral component of the proposal defense, the student addresses not only the specific research topic about which they will write but situates that topic in the larger body of relevant policy literatures; the defense serves as the comprehensive examination. Procedures for establishing the dissertation committee are addressed in the *Student Handbook* and in the Public Policy Seminar course.

Advising/Committees

While the Program Director serves as the *de facto* advisor for each student for the first year, the Program Director works with the students and faculty to help the student work with a suitable advisor. Once the student is matched with the advisor, they work closely with that advisor on suggested schedules of classes, research options, and other issues important to success. After approximately one year in the program, each student is expected to have identified the faculty member with whom they would like to mentor, with the expectation that this mentor would ultimately serve on the student's committees. Following completion of the policy field courses, students establish their dissertation advisor and form a dissertation committee. The procedures for establishing these committees are in the *Student Handbook* and are addressed in the Public Policy Seminar.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar. After successful defense of the dissertation, a student will be conferred with the doctoral degree.

Assistantships

The Ph.D. in Public Policy is committed to academic year funding for all full-time students. Additional support for summer sessions may be available through program funds and research grants working with program faculty. Available options for funding include graduate assistantships, teaching assistantships for those interested in careers in academia, and scholarships. For more information on funding options, contact the Director of the Public Policy Program.

Research Opportunities

The Ph.D. Program in Public Policy has an extensive pool of professors to enhance the research opportunities and experiences for the students. Each program of study could be individually tailored for the research of the student with

the possibility of individual studies under the supervision of an advisor.

Residency Requirement

Students must satisfy the residency requirement for the program by completing 21 hours of continuous enrollment, either as coursework or dissertation credits. Residence is considered continuous if the student is enrolled in one or more courses in successive semesters until 21 hours are earned. All 18 hours of dissertation credit must be earned at UNC Charlotte.

Time Limits for Completion

The student must achieve admission to candidacy within six years after admission to the program. All requirements for the degree must be completed within nine years after first registration as a doctoral student. These time limits are maximums; full-time students will typically complete the degree requirements in five years.

Transfer Credit

The Program will accept up to two courses in the core curriculum as transfer credit from a college or university accredited by an accepted accrediting body, providing that the Admissions Committee determines that these courses are equivalent to those offered in the core or one of the specialty areas. The acceptance of transfer credit is subject to the approval of the Graduate School. The grade in these transfer credits must have been A or B. All of the dissertation work must be completed at UNC Charlotte.

Graduate Certificate in Public Policy Research and Analysis

The Graduate Certificate in Public Policy Research and Analysis provides students with a strong grounding in the processes through which public policies are designed, passed, implemented, and evaluated in conjunction with the training in quantitative and analytic skills necessary to carry out applied public policy research and analysis. The program requires the completion of 15 credit hours. The certificate must be completed within four years of admission, and students may apply credits earned towards a graduate degree program in conjunction with or after the certificate has been awarded.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for admission into the Graduate Certificate in Public Policy Research and Analysis:

- A bachelor's degree or master's degree (or its equivalent) from a college or university accredited by an accepted accrediting body
- Official transcripts of all college coursework attempted
- A GPA of 3.0 or above on a 4.0 scale for all prior coursework completed beyond secondary school (high school)
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the student's native language and if they have not earned a post-secondary degree from a U.S. or English-speaking institution
- An online application for the program through the Graduate School's application system

Recommended qualifications include:

- Submission of Graduate Record Exam (GRE) scores showing strong proficiency in math and verbal aptitude
- Completion of one or more social science statistics or econometrics courses prior to entering the program

Certificate Requirements

Core Courses in Research and Design (9 credit hours)

PPOL 8600 - Policy Process I (3)
PPOL 8602 - Research Design in Public Policy (3)
PPOL 8630 - Advanced Program Evaluation (3)

Quantitative Analysis Methods Course (3 credit hours)

Select one of the following:

GRAD 6100 - Basic Statistics and Probability (3)
GRAD 6101 - Linear Regression (3)
GRAD 6102 - Categorical Outcomes (3)
GRAD 6103 - Classificatory Methods and Time Series (3)
GRAD 6104 - Spatial Statistics (3)
GRAD 8101 - Linear Regression (3)
GRAD 8102 - Categorical Outcomes (3)
GRAD 8103 - Classificatory Methods and Time Series (3)
GRAD 8104 - Spatial Statistics (3)

Elective Course (3 credit hours)

Select one of the following or seek approval from the Graduate Program Director for an alternative elective course numbered at the 6000 level or above:

GRAD 8101 - Linear Regression (3)
GRAD 8102 - Categorical Outcomes (3)
GRAD 8103 - Classificatory Methods and Time Series (3)
GRAD 8104 - Spatial Statistics (3)
PPOL 8622 - Qualitative Methods in Public Policy (3)
PPOL 8635 - Ethics of Public Policy (3)
PPOL 8640 - Economic Analysis of Public Policy I (3)
PPOL 8701 - Advanced Macroeconomic Theory (3)
PPOL 8703 - Advanced Microeconomic Theory (3)

Certificate Total = 15 Credit Hours

Grade Requirements

Students must maintain a minimum GPA of 3.0 across all certificate coursework, with no more than one grade of C among courses that apply towards the certificate.

RELIGIOUS STUDIES

- M.A. in Religious Studies

Department of Religious Studies

religiousstudies.charlotte.edu

M.A. in Religious Studies

The M.A. in Religious Studies program approaches the academic study of religion and religions from a variety of critical and interdisciplinary perspectives, with an emphasis placed on the global and multicultural aspects of religion. The department offers courses in theories and methods as well as a variety of religious traditions, studied in their historical and contemporary manifestations.

Admission Requirements

In addition to meeting the University's graduate admission requirements, all prospective students must submit an essay (statement of purpose) that specifically addresses their motivation for pursuing the M.A. in Religious Studies, including some discussion of their research interests and career or professional goals.

Test Scores Waiver

Students graduating with a bachelor's degree from the UNC Charlotte Department of Religious Studies are exempt from submitting standardized test scores for admission. Students who have received a 3.2 GPA or above from a college or university accredited by an accepted accrediting body are also exempt from submitting standardized test scores. All other students must submit GRE or MAT standardized test scores as part of their application. Standardized test scores and letters of reference can be no more than five years old.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Master of Arts in Religious Studies requires the completion of a minimum of 30 credit hours of approved graduate coursework. At least 12 credit hours of this total must be in courses open only to graduate students (i.e., at the 6000 level or higher). Students have two options for completing their degree: (1) Students may complete an

M.A. Thesis option that consists of 24 credit hours of coursework and 6 credit hours of thesis work; or (2) Students may complete a comprehensive examination option consisting of 30 credit hours of coursework and comprehensive examinations in three areas. All degree requirements must be completed within seven calendar years of first enrollment in the program. Up to 6 credit hours earned from a college or university accredited by an accepted accrediting body may be eligible for transfer credit. Formal approval must be obtained from the Graduate Program Director and the Dean of the Graduate School.

Core Course (3 credit hours)

All M.A. candidates must complete the following course with grades of B (3.0) or above within three semesters of their initial admission into the program.

RELS 6101 - Approaches to the Study of Religion (3)

Elective Courses

Students work with their advisor to select elective courses. Up to 6 hours of related graduate credit may be earned outside the Department of Religious Studies. Such courses must be formally approved by the Graduate Program Director.

Degree Total = 30 Credit Hours

Grade Requirements

A GPA of 3.0 or above is required for the minimum of 30 credit hours of approved graduate coursework.

Advising

The Graduate Program Director serves as formal advisor to the department's graduate students.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Foreign Language Requirement

Although students are not required to demonstrate proficiency in a foreign language as a formal matriculation requirement of the program, they are expected to acquire competency in and use whatever languages they need to pursue their research interests.

Committees for Thesis and Examination Options

Three-member faculty committees, consisting of two graduate faculty members from the Department of Religious Studies and a third member selected from Religious Studies or another department, conduct the comprehensive examinations and oversee the student's

thesis work. For those choosing the exam option, one of the examining faculty members will be the student's instructor for RELS 6101.

SOCIOLOGY

- **M.A. in Sociology**
 - Applied Social Research

Department of Sociology
sociology.charlotte.edu

M.A. in Sociology

The Master of Arts in Sociology provides students with theoretical and methodological skills necessary to undertake analysis of contemporary social issues and problems. The curriculum is designed to meet the needs of students seeking master's level research skills for occupations requiring such expertise: in government, marketing, program planning and evaluation, business, the media, and in the nonprofit sector. The curriculum also prepares students who wish to pursue the Ph.D., whether in sociology or a related discipline. The Department of Sociology is a core part of the Ph.D. programs in Public Policy and Organizational Science at UNC Charlotte.

Coursework concentrates on building skills in research design, sampling, data analysis, interpretation and sociological theory. Students complete either a thesis, with oral defense, or a research practicum. Either option entails the student applying sociological knowledge to a problem/topic of their interest. In addition to traditional classroom courses, students can tailor their coursework to specific areas of interest through individualized tutorials. A variety of research interests are represented among the Sociology faculty. Among these are Education, Healthcare, Group Processes (Social Psychology), Social Movements, Stratification, Organizations, and Mathematical Sociology. Through coursework and tutorials students can gain a substantive knowledge base that complements their social research skills.

An optional Concentration in Applied Social Research is available. It is designed for students who want to further develop their skills for applied social research. It is an ideal option for students who are interested in using their sociological training to analyze social issues and to solve practical problems. This concentration can be completed in one year of study.

Admission Requirements

- An overall undergraduate GPA of 3.0 or above
- Demonstrate undergraduate competence in research methods, theory and statistics for social research
- 18 credit hours of social science undergraduate courses

- Complete application submitted online through the Graduate School's application system including: statement of purpose (essay); three letters of recommendation; transcript(s) of all academic work attempted beyond high school; official GRE scores (optional); and resume

Note: Standardized test scores (e.g., GRE, GMAT, MAT) are optional, but not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The program requires 35 credit hours of coursework. To provide all students with a solid grounding in theory and methods of sociological inquiry, 15 credit hours of core courses are required. In addition to the core, students take elective courses and may elect an optional concentration. Finally, students must complete either a thesis or a research practicum (the research practicum is required for students in the concentration).

Core Courses (15 credit hours)

SOCY 5151 - Pro-Seminar: Social Problems and Social Policy (3)
SOCY 6651 - Social Theory (3)
SOCY 6652 - Issues in Social Research (3)
GRAD 6100 - Basic Statistics and Probability (3)
GRAD 6101 - Linear Regression (3)*

**The Graduate Program Director may waive the requirement for GRAD 6100 if the student presents evidence of quantitative skills comparable to what is learned in the course. This would not alter the number of credit hours required for the major.*

Concentration Requirements (12 credit hours)

Students may complete the M.A. in Sociology without a formal concentration or with an optional concentration.

No Concentration

Students not electing an optional concentration must complete the following requirements for their degree program.

Restricted Elective Courses (6 credit hours)
Select at least two SOCY courses.

Thesis or Research Practicum (6 credit hours)

Students select to do either a thesis or research practicum. Students choosing the thesis formulate a theoretically motivated or applied research question or argument and collect or analyze existing empirical data to answer that question.

As an alternative to the traditional thesis, students have the option of a research practicum. This may be combined with an internship. The student works with an organization or agency to complete a research evaluation project for the agency.

Select one of the following:

SOCY 6897 - Research Practicum (1 to 6)

SOCY 6996 - Thesis (1 to 6)

Applied Social Research Concentration

Students in this concentration must complete the core curriculum for the M.A. in Sociology and choose the research practicum option in lieu of the thesis requirement. At least two additional courses in research methods must also be completed for a minimum of 6 credit hours.

Research Practicum (6 credit hours)

Students must complete 6 credit hours of Research Practicum. The last 3 credit hours must be taken in the final semester.

Elective Courses (6 credit hours)

Students must complete at least 2 elective courses in research methods for a minimum of 6 credit hours. Electives are to be chosen, in consultation with committee members, from the following courses. Students may petition to use appropriate courses not listed below as substitutes to fulfill their concentration requirement.

GRAD 6102 - Categorical Outcomes (3)

GRAD 6103 - Classificatory Methods and Time Series (3)

GRAD 6104 - Spatial Statistics (3)

GRAD 6340 - Data Analysis and Presentation for Impact (2)

SOCY 6136 - Qualitative Research Methods (3)

SOCY 6617 - Data Utilization (3)

SOCY 6640 - Evaluation Research for Applied Sociology (3)

Unrestricted Elective Courses (8 credit hours)

Subject to the approval of the Graduate Program Director, students may take elective courses (up to 6 credit hours) from other departments as long as courses are at the graduate level (5000 or above) and the student's areas of interest overlap with other programs (e.g., psychology, education, organizational science, public policy, history, geography). Courses taught in other programs (e.g., Public Policy, Organizational Science) by Sociology faculty do not count as coursework outside of the department.

Degree Total = 35 Credit Hours**Grade Requirements**

Students must earn a grade of B above in each course required for the program. Two grades of C from courses taken inside or outside of the Department of Sociology will result in suspension from the program. Students wishing to re-enter the program must reapply. Readmission is not guaranteed. The application must address causes of poor performance and an amelioration plan. Readmitted students must retake any courses where a grade of C was earned. Two additional grades of C will result in permanent expulsion from the program.

Admission to Candidacy

Completion of at least 24 credit hours of required coursework is required for admission to candidacy.

Advising

The Graduate Program Director advises all graduate students until they select a person to serve as their Committee Chair.

Assistantships

The Department of Sociology offers both teaching assistantships and research assistantships; the latter are dependent upon faculty research funding. Teaching assistants assist faculty with coursework, or teach the undergraduate lab sections in research methods and statistics. They are paid approximately \$10,000 for nine months of twenty hours per week work during the academic year. The workload and pay for research assistants varies. Assistantships are awarded on the basis of merit and experience.

Committee

The student's committee shall consist of three faculty members: the Chair and two other individuals who assist with completion of the thesis or research practicum. One member of the committee, not the chair, may be from outside the department.

Financial Assistance

Other than the assistantships and waivers described above, the Department offers the Pearson Fellowship, which is awarded annually to a graduate or undergraduate student who has interests and goals in improving race relations, expanding social justice, and establishing a more peaceful world. The award is made every spring and consists of \$1,000 to be applied to tuition at UNC Charlotte.

Internships

While there is no formal system of ongoing internships, agencies do contact the department to find students who would be interested in an internship. Consequently, internships are optional and dependent upon a match between an agency's needs and a student's skills and interests.

Research Opportunities/Experiences

Faculty members are actively engaged in research and students are strongly recommended to work with faculty to develop research expertise. In addition, a number of faculty members have funded research projects or internships on which qualified graduate students are able to work.

Transfer Credit

With departmental approval, students may transfer in up to six credit hours of graduate work for which the applicant received a grade of B or above from another institution, related UNC Charlotte degree program or related post-baccalaureate work.



Klein College of Science

science.charlotte.edu

The Klein College of Science was established in 2023 with Founding Dean Bernadette Donovan-Merkert as part of a strategic reorganization to enhance the focus on scientific disciplines at UNC Charlotte. The college encompasses the departments of Biological Sciences, Chemistry, Mathematics and Statistics, and Physics and Optical Science, as well as the Botanical Gardens and McMillan Greenhouse. The college is committed to fostering a collaborative community that supports student success in science and mathematics, even for those whose majors lie outside these fields. The Klein College of Science is home to more than 2,000 undergraduate and graduate majors and also plays a crucial role in providing general education requirements for all UNC Charlotte students with specialized science and mathematics training.

Overall, the Klein Hall and Klein College of Science represent a significant advancement for UNC Charlotte. They embody the university's commitment to scientific excellence and innovation, providing students and faculty with the resources and environment needed to thrive in their academic and research endeavors. The generosity of Gené and Fred Klein has not only transformed the physical landscape of the campus but also set the stage for future scientific breakthroughs and educational advancements.

The Klein College of Science is one of the eight discipline-based colleges at the University of North Carolina at Charlotte, housing 18 academic departments and numerous interdisciplinary programs. The College serves the Charlotte region and the state of North Carolina and is

engaged in the discovery, dissemination, synthesis and application of knowledge. It provides for the educational, economic, social, and cultural advancement of the people of North Carolina through on-and off-campus programs, continuing personal and professional education opportunities, research and collaborative relationships with the private, public, and nonprofit institutional resources of the greater Charlotte metropolitan region. The College offers a wide array of graduate programming including graduate certificate, Master of Arts, Master of Science, and Ph.D. programs.

Graduate Degree Programs

- Master of Science in Applied Physics
- Master of Science in Biology
- Master of Science in Chemistry
- Master of Science in Mathematics
- Master of Science in Mathematical Finance (*see the Belk College of Business section*)
- Master of Science in Optical Science and Engineering (*with The William States Lee College of Engineering*)
- Ph.D. in Applied Mathematics
- Ph.D. in Biology
- Ph.D. in Chemistry and Nanoscale Science
- Ph.D. in Curriculum and Instruction: Mathematics Education Concentration (*see the College of Education section*)
- Ph.D. in Optical Science and Engineering (*with The William States Lee College of Engineering*)

Graduate Non-Degree Programs

- Graduate Certificate in Biomedical Sciences
- Graduate Certificate in Biotechnology

BIOLOGY

- **Ph.D. in Biology**
 - Ecology, Evolution, and Environmental Biology
 - Molecular, Cellular, and Developmental Biology
 - Molecular Biophysics
- **M.S. in Biology**
 - Ecology, Evolution, and Environmental Biology
 - Molecular, Cellular, and Developmental Biology
- **Graduate Certificate in Biomedical Sciences**
- **Graduate Certificate in Biotechnology**

Department of Biological Sciences

biology.charlotte.edu

Ph.D. in Biology

The Ph.D. in Biology program has as its intellectual focus an interdisciplinary synthesis of the biological sciences and related biotechnology. In addition to a vigorous research concentration, the program emphasizes the importance of relevant coursework. All students are required to complete a series of core courses related to the interdisciplinary nature of the program. Before selecting electives, students must choose a concentration-- (1) Ecology, Evolution, and Environmental Biology (E3B); (2) Molecular, Cellular, and Developmental Biology (MCD); or (3) Molecular Biophysics. The cornerstone of the program is the student's research dissertation. Each dissertation is expected to be a significant scientific contribution based on independent and original research, leading to publications in national/international peer-reviewed journals.

For further information, please see the department website at biologicalsciences.charlotte.edu.

Admission Requirements

Applicants will be evaluated in a holistic manner to identify those who have the greatest potential for success. In addition to the general requirements for admission to the Graduate School, to begin study toward the Interdisciplinary Ph.D. in Biology, students admitted to the program should have:

- 1) A B.S. or B.A. degree from a college or university accredited by an accepted accrediting body.
- 2) An overall grade point average of at least 3.0 out of 4.0. Additionally, applicants must have a grade point average of at least 3.5 in biology, 3.0 in chemistry, and 3.0 in mathematics.

- 3) A minimum of 24 hours in biology, including at least one course in genetics, physiology, and cell/molecular biology. Additionally, applicants should have one year each of general chemistry, organic chemistry, physics, and mathematics. Applicants with academic deficiencies may be admitted on the condition that any deficiencies are corrected during the first year of graduate study. The Graduate Ph.D. Committee will determine the remediation necessary for identified deficiencies.
- 4) A score of at least 100 on the Internet-based, 220 on the computer-based, or 557 on the paper-based Test of English as a Foreign Language (TOEFL), or a minimum overall band score of 6.5 on the IELTS, for applicants whose native language is not English. Students who do not pass this examination must pass ENGL 1100 (English as a Foreign Language) with a grade of C or above. In addition, these students who will be involved in any instructional activity (e.g., teaching assistants) will be required to be evaluated by the English Language Training Institute at UNC Charlotte prior to the beginning of the first semester of study.
- 5) Three letters of reference, at least two of which must be from faculty members.

GRE Waiver

The GRE General Test requirement is waived for all applicants to the Ph.D. in Biology program.

Degree Requirements

The Ph.D. acknowledges the value of coursework as background and preparation for research, but the primary emphasis of the program is on the development of research skills and the completion of a research project on a significant problem in the biological sciences or related biotechnology.

The program requires 72 post-baccalaureate credit hours. All students are required to take a general curriculum that includes a sequence of courses as shown below.

Core Required Courses (10 credit hours)

BIOL 8101 - Hypothesis Testing (3)
 BIOL 8102 - Cellular and Molecular Biology (3)
 BIOL 8140 - Evolutionary Biology (3)
 BIOL 8201 - Seminar (1)

Research and Ethics Course (2-3 credit hours)

Select one of the following:

BIOL 8260 - Careers in Bioscience: Professional Development and Responsible Conduct (2)
 GRAD 8302 - Responsible Conduct of Research (2)
 PHIL 8240 - Research Ethics in the Biological and Behavioral Sciences (3)

Concentration Required Courses (8 credit hours)

Select from the following, based on concentration:

Ecology, Evolution and Environmental Biology (E3B) Concentration

- BIOL 8241 - Environmental Biology (3)
- 5 additional credit hours of Concentration Elective Courses from the list below

Molecular, Cellular and Developmental Biology (MCD) Concentration

- BIOL 8270 - Biological Pathways and Metabolism (3)
- 5 additional credit hours of Concentration Elective Courses from the list below

Molecular Biophysics (MBP) Concentration

- PHYS 6108 - Biophysics (3)
- PHYS 6204 - Methods of Molecular Modeling and Simulation in Physics (3)
- PHYS 6610 - Biophysics Seminar (1) (Seminar to be taken twice)

In lieu of elective credits, students meet the remaining credits with additional hours of dissertation research, lab rotations, internship, or tutorial to be determined in consultation with the student's dissertation committee.

Concentration Elective Courses

Students in either the E3B or MCD concentration select Concentration Elective Courses from the following. Elective courses outside the concentration may be substituted upon approval from the Supervisory Committee and Graduate Program Director.

Ecology, Evolution, and Environmental Biology Concentration Elective Courses

Select from the following:

BIOL 5000 - Advanced Topics in Biology (1 to 4)
 BIOL 5111 - Evolution (3)
 BIOL 5121 - Advanced Biometry (4)
 BIOL 5144 - Advanced Ecology (4)
 BIOL 5162 - Advanced Biotechnology I (3)
 BIOL 5163 - Advanced Biotechnology II (3)
 BIOL 5168 - Recombinant DNA Techniques (4)
 BIOL 5184 - Plant Biotechnology (3)
 BIOL 5189 - Mechanisms in Development (3)
 BIOL 5199 - Molecular Biology (3)
 BIOL 5205 - Advanced Horticulture (3)
 BIOL 5221 - Plant Systematics (4)
 BIOL 5229 - Dendrology (4)
 BIOL 5234 - Wildlife Biology (3)
 BIOL 5235 - Mammalogy (4)
 BIOL 5242 - The Biology of Birds (3)
 BIOL 5242L - The Biology of Birds Lab (1)
 BIOL 5243 - Animal Behavior (3)
 BIOL 5244 - Conservation Biology (3)
 BIOL 5250 - Microbiology (3)
 BIOL 5250L - Microbiology Laboratory (1)

BIOL 5253 - Marine Microbiology (4)
 BIOL 5257 - Microbial Physiology and Metabolism (3)
 BIOL 5260 - Population Genetics (3)
 BIOL 5277 - Endocrinology (3)
 BIOL 5282 - Developmental Plant Anatomy (3)
 BIOL 5282L - Developmental Plant Anatomy Laboratory (1)
 BIOL 5283 - Developmental Biology (3)
 BIOL 5283L - Developmental Biology Laboratory (1)
 BIOL 5293 - Comparative Vertebrate Anatomy (4)
 BIOL 6000 - Special Topics in Biology (1 to 4)
 BIOL 6800 - Tutorial (1 to 4)
 BIOL 8000 - Special Topics in Biology (1 to 4)
 BIOL 8200 - Interdisciplinary Colloquium (1)
 BIOL 8800 - Laboratory Rotations (2)

***Molecular, Cellular, and Developmental Biology
Concentration Elective Courses***

Select from the following:

BIOL 5000 - Advanced Topics in Biology (1 to 4)
 BIOL 5121 - Advanced Biometry (4)
 BIOL 5162 - Advanced Biotechnology I (3)
 BIOL 5163 - Advanced Biotechnology II (3)
 BIOL 5167 - Medical Genetics (3)
 BIOL 5168 - Recombinant DNA Techniques (4)
 BIOL 5171 - Cell Physiology (3)
 BIOL 5189 - Mechanisms in Development (3)
 BIOL 5199 - Molecular Biology (3)
 BIOL 5233 - Parasitology (3)
 BIOL 5250 - Microbiology (3)
 BIOL 5250L - Microbiology Laboratory (1)
 BIOL 5251 - Immunology (3)
 BIOL 5251L - Immunology Laboratory (1)
 BIOL 5254 - Epidemiology (3)
 BIOL 5255 - Bacterial Genetics (3)
 BIOL 5256 - Pathogenic Bacteriology (3)
 BIOL 5256L - Pathogenic Bacteriology Laboratory (1)
 BIOL 5257 - Microbial Physiology and Metabolism (3)
 BIOL 5258 - Epidemics and Plagues (3)
 BIOL 5259 - Advanced Virology (3)
 BIOL 5259L - Advanced Virology Laboratory (1)
 BIOL 5265 - Drugs: Molecular and Cellular Mechanisms (3)
 BIOL 5277 - Endocrinology (3)
 BIOL 5279 - Neurobiology (3)
 BIOL 5282 - Developmental Plant Anatomy (3)
 BIOL 5282L - Developmental Plant Anatomy Laboratory (1)
 BIOL 5283 - Developmental Biology (3)
 BIOL 5283L - Developmental Biology Laboratory (1)
 BIOL 5292 - Advances in Immunology (3)
 BIOL 6000 - Special Topics in Biology (1 to 4)
 BIOL 6010 - Special Topics in Microbiology (1 to 4)
 BIOL 6103 - Immunology of Infection (4)
 BIOL 6104 - Integrative Systems Physiology (4)
 BIOL 6273 - Advanced Human Physiology (3)
 BIOL 6274 - Advanced Human Pathophysiology (3)
 BIOL 6800 - Tutorial (1 to 4)
 BIOL 8000 - Special Topics in Biology (1 to 4)
 BIOL 8010 - Special Topics in Microbiology (1 to 4)

BIOL 8103 - Immunology of Infection (4)
 BIOL 8104 - Integrative Systems Physiology (4)
 BIOL 8200 - Interdisciplinary Colloquium (1)
 BIOL 8201 - Seminar (1)
 BIOL 8366 - Advanced Protein Biotechnology (3)
 BIOL 8800 - Laboratory Rotations (2)

Dissertation (18 credit hours)

The doctoral program of study must include a minimum of 18 hours of dissertation credit. Students must complete and defend a dissertation based on a research program approved by their dissertation committee, which results in a high quality, original and substantial piece of research. Students must orally present and successfully defend the dissertation to their dissertation committee in a defense that is open to the public. A copy of the dissertation must be made available for review by the program doctoral faculty at least two weeks prior to the public defense.

BIOL 8999 - Dissertation Research (*minimum of 18 credit hours*)

Student Teaching

Every student must teach at least once. This requirement is satisfied by being a Graduate Teaching Assistant for one course for one semester.

Degree Total = 72 Credit Hours

Grade Requirements

Students must maintain a cumulative average of 3.0 in all coursework taken for graduate credit. Lab rotations and the dissertation research are graded on a Pass/Unsatisfactory basis and therefore are not included in the cumulative average. An accumulation of one C grade results in suspension from the program; two C grades results in termination of enrollment in the graduate program. If students make a grade of U in any course, enrollment in the program is terminated.

Advancement to Candidacy

For Advancement to Candidacy, students must pass the Qualifying Examination by the end of the 5th semester of study. The Qualifying Examination can be taken only after all coursework for the degree has been completed, with the exception of the Doctoral Dissertation Research. Following successful completion of the Qualifying Examination, a dissertation topic is proposed to the student's Dissertation Committee by the end of the 6th semester of study. Students advance to candidacy following approval of the proposed dissertation topic by their Dissertation Committee and the Dean of the Graduate School.

Deadlines and Time Limits

All requirements for the degree must be completed within nine years after first registration as a doctoral student. Students must achieve admission to candidacy within six years after admission to the program and complete all requirements within six years after admission to candidacy for the Ph.D. degree. These time limits are maxima; students are typically expected to complete the degree requirements within five years.

- a) A student must have an advisor by no later than the end of the 2nd semester.
- b) A student must establish their Dissertation Committee by the end of the 3rd semester.
- c) A student must have a Program of Study/Curriculum Contract approved by the Dissertation Committee by the end of the 3rd semester.
- d) The student and Dissertation Committee must meet by the end of the 4th semester to set a timeline for the candidacy exam.
- e) The student is required to meet with their Dissertation Committee at least once a year.
- f) The deadline for completing the candidacy exam is the end of the student's 5th semester.
- g) A student must have a Dissertation Proposal approved by their Dissertation Committee by the end of the 6th semester.

Departmental Seminars

Graduate students are expected to attend all seminars sponsored by the Department of Biological Sciences. In addition, each student is required to make a 20 minute presentation on their research at the departmental seminar after entering their 2nd year in the program. The Graduate Program Director will work out the logistics with the department seminar coordinator concerning the arrangement of students' presentations.

Laboratory Research Rotations

Optional laboratory research rotations allow the student to sample areas of research and become familiar with program faculty. Students may engage in a maximum of 3 rotations. Each rotation consists of a minimum of 4 weeks and there is no expectation that the work done during the rotation results in a publication. By the end of their second semester, students must have determined their major advisor. A rotation must have been completed in the advisor's laboratory.

The purpose of a laboratory rotation is to learn and perform techniques associated with the lab, and to potentially identify a Dissertation Advisor. A typical rotation involves 5-10 hours per week in the laboratory for 4-10 weeks. Students are encouraged to identify a sponsoring faculty member well in advance of the scheduled rotation. Students must meet with the sponsoring faculty member to determine what will be done during the rotation (i.e., techniques to be learned and

identification of the project to be completed). At the end of the rotation, students must write a one- to two-page synopsis of the rotation to be signed by the sponsoring faculty member and turned in to the Graduate Program Director.

Obtaining the Non-Thesis M.S. While Completing the Ph.D. Degree

Ph.D. students may choose to receive the non-thesis M.S. degree while continuing to work toward the doctoral degree provided they have successfully completed the Qualifying Examination and completed at least 30 credit hours of coursework, and two credit hours of BIOL 6800 (Tutorial) culminating in a written assignment developed in consultation with the student's major advisor. Obtaining the non-thesis M.S. requires dual enrollment in the Ph.D. and M.S. programs. Doctoral students can apply for enrollment in the M.S. program after entering the Ph.D. program.

Transfer Credit

Only courses with grades of A or B may be accepted for transfer credit; courses graded IP/P typically cannot be transferred among graduate programs. Although the maximum amount of credit past the baccalaureate degree that a Ph.D. student may count towards the doctorate is 30 credit hours, only courses appropriate for the program and curriculum in which the student is enrolled may be transferred. This should be determined by the student's Dissertation Committee and approved by the Graduate Program Director, before the request is submitted to the Graduate School. This rule applies whether the courses were taken at UNC Charlotte or elsewhere, and whether a Master's degree was earned or not. However, no more than six hours taken when the student was in post-baccalaureate (non-degree seeking) status may be applied toward the doctoral degree.

UNC Charlotte Residency Requirement

Students must satisfy the UNC Charlotte residency requirement for the program by completing 20 credit hours, either as coursework or research credits. Residence is considered to be continuous if students are enrolled in one or more courses in successive semesters until 20 credit hours are earned.

M.S. in Biology

The M.S. in Biology degree program is designed for students who desire to pursue advanced studies in professional and graduate schools or various vocational opportunities in biology and related areas (see biologicalsciences.charlotte.edu). The program provides the opportunity for broad training in a variety of biological areas as well as specialization in areas of particular interest

through (1) the Ecology, Evolution, and Environmental Biology (E3B) concentration and (2) the Molecular, Cellular, and Developmental Biology (MCB) concentration. Selection of either concentration is optional.

The Department of Biological Sciences offers the thesis and non-thesis track within the M.S. degree. The thesis track is designed for students whose career goals include formal research training. The non-thesis track is designed for students whose career goals include graduate education, but not formal research experience. Students may switch between the thesis and non-thesis tracks with written approval from their major advisor and the Graduate Program Director.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following requirements are specific to the Department of Biological Sciences:

- 1) A B.S. or B.A. degree from a college or university accredited by an accepted accrediting body.
- 2) Evidence of undergraduate preparation in biology with a minimum 24 credit hours in biology and 24 credit hours of cognate study.
- 3) An overall grade point average of at least 3.0 out of 4.0. Additionally, applicants must have a grade point average of at least 3.0 in biology.
- 4) A score of at least 100 on the Internet-based, 220 on the computer-based, or 557 on the paper based Test of English as a Foreign Language (TOEFL), or a minimum overall band score of 6.5 on the IELTS, for applicants whose native language is not English. Students who do not pass this examination must pass ENGL 1100 (English as a Foreign Language) with a grade of C or above. In addition, these students who will be involved in any instructional activity (e.g., teaching assistants) will be required to be evaluated by the English Language Training Institute at UNC Charlotte prior to the beginning of the first semester of study.
- 5) Three letters of reference, at least two of which must be from faculty members.

GRE Waiver

The GRE General Test requirement is waived for all applicants to the M.S. in Biology program.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

All M.S. students must complete 30 credit hours of coursework approved by a Supervisory Committee, including the following courses:

Required Courses

BIOL 6101 - Hypothesis Testing (3)
BIOL 6102 - Cellular and Molecular Biology (3)
BIOL 6140 - Evolutionary Biology (3)

Research and Ethics Course

Select one of the following:

BIOL 6260 - Careers in Bioscience: Professional Development and Responsible Conduct (2)
GRAD 6302 - Responsible Conduct of Research (2)
PHIL 6240 - Research Ethics in the Biological and Behavioral Sciences (3)

Concentration Elective Courses

Students may choose either (1) the Ecology, Evolution, and Environmental Biology (E3B) concentration or (2) the Molecular, Cellular, and Developmental Biology (MCD) concentration when selecting elective courses, although selection of a concentration is not required. Elective courses outside the concentration may be substituted upon approval from the Supervisory Committee and Graduate Program Director. In addition to coursework, each degree candidate must pass an oral candidacy examination administered by the Supervisory Committee.

Ecology, Evolution, and Environmental Biology (E3B) Concentration Elective Courses

Select from the following:

BIOL 5000 - Advanced Topics in Biology (1 to 4)
BIOL 5111 - Evolution (3)
BIOL 5121 - Advanced Biometry (4)
BIOL 5144 - Advanced Ecology (4)
BIOL 5162 - Advanced Biotechnology I (3)
BIOL 5163 - Advanced Biotechnology II (3)
BIOL 5168 - Recombinant DNA Techniques (4)
BIOL 5184 - Plant Biotechnology (3)
BIOL 5189 - Mechanisms in Development (3)
BIOL 5199 - Molecular Biology (3)
BIOL 5205 - Advanced Horticulture (3)
BIOL 5221 - Plant Systematics (4)
BIOL 5229 - Dendrology (4)
BIOL 5234 - Wildlife Biology (3)
BIOL 5235 - Mammalogy (4)
BIOL 5242 - The Biology of Birds (3)
BIOL 5242L - The Biology of Birds Lab (1)
BIOL 5243 - Animal Behavior (3)
BIOL 5244 - Conservation Biology (3)
BIOL 5250 - Microbiology (3)
BIOL 5250L - Microbiology Laboratory (1)
BIOL 5253 - Marine Microbiology (4)
BIOL 5257 - Microbial Physiology and Metabolism (3)

BIOL 5260 - Population Genetics (3)
 BIOL 5277 - Endocrinology (3)
 BIOL 5282 - Developmental Plant Anatomy (3)
 BIOL 5282L - Developmental Plant Anatomy Laboratory (1)
 BIOL 5283 - Developmental Biology (3)
 BIOL 5283L - Developmental Biology Laboratory (1)
 BIOL 5293 - Comparative Vertebrate Anatomy (4)
 BIOL 6000 - Special Topics in Biology (1 to 4)
 BIOL 6800 - Tutorial (1 to 4)

***Molecular, Cellular, and Developmental Biology (MCD)
 Concentration Elective Courses***

Select from the following:

BIOL 5000 - Advanced Topics in Biology (1 to 4)
 BIOL 5121 - Advanced Biometry (4)
 BIOL 5162 - Advanced Biotechnology I (3)
 BIOL 5163 - Advanced Biotechnology II (3)
 BIOL 5167 - Medical Genetics (3)
 BIOL 5168 - Recombinant DNA Techniques (4)
 BIOL 5171 - Cell Physiology (3)
 BIOL 5189 - Mechanisms in Development (3)
 BIOL 5199 - Molecular Biology (3)
 BIOL 5233 - Parasitology (3)
 BIOL 5250 - Microbiology (3)
 BIOL 5250L - Microbiology Laboratory (1)
 BIOL 5251 - Immunology (3)
 BIOL 5251L - Immunology Laboratory (1)
 BIOL 5254 - Epidemiology (3)
 BIOL 5255 - Bacterial Genetics (3)
 BIOL 5256 - Pathogenic Bacteriology (3)
 BIOL 5256L - Pathogenic Bacteriology Laboratory (1)
 BIOL 5257 - Microbial Physiology and Metabolism (3)
 BIOL 5258 - Epidemics and Plagues (3)
 BIOL 5259 - Advanced Virology (3)
 BIOL 5259L - Advanced Virology Laboratory (1)
 BIOL 5265 - Drugs: Molecular and Cellular Mechanisms (3)
 BIOL 5277 - Endocrinology (3)
 BIOL 5279 - Neurobiology (3)
 BIOL 5282 - Developmental Plant Anatomy (3)
 BIOL 5282L - Developmental Plant Anatomy Laboratory (1)
 BIOL 5283 - Developmental Biology (3)
 BIOL 5283L - Developmental Biology Laboratory (1)
 BIOL 5292 - Advances in Immunology (3)
 BIOL 6000 - Special Topics in Biology (1 to 4)
 BIOL 6010 - Special Topics in Microbiology (1 to 4)
 BIOL 6103 - Immunology of Infection (4)
 BIOL 6104 - Integrative Systems Physiology (4)
 BIOL 6273 - Advanced Human Physiology (3)
 BIOL 6274 - Advanced Human Pathophysiology (3)
 BIOL 6366 - Advanced Protein Biotechnology (3)
 BIOL 6800 - Tutorial (1 to 4)

M.S. Degree: Thesis Track

At least 16 of the 30 credit hours required for the degree, including no more than eight hours of thesis research, must be in courses at the 6000-level. The candidate must prepare a written thesis based upon original research

acceptable to the Supervisory Committee and the Dean of the Graduate School. Students have the opportunity to conduct their thesis research under the co-direction of a Biology faculty member and select faculty at the Carolinas Medical Center in Charlotte. The student must orally present and successfully defend the thesis to the student's Supervisory Committee in a defense open to the public.

M.S. Degree: Non-Thesis Track

At least 12 of the 30 credit hours required for the degree must be in courses at the 6000-level, including two credit hours of BIOL 6800 (Tutorial) culminating in a written assignment developed in consultation with the major advisor. A maximum of two credit hours of non-thesis research (BIOL 6901) may be taken as an elective, and students are encouraged to gain research experience. No written thesis or oral thesis defense is required for the non-thesis track.

Proportion of Courses Open Only to Graduate Students

At least 16 of the 30 required hours, including no more than eight hours of thesis research, must be in courses open to graduate students only.

Degree Total = 30 Credit Hours

Grade Requirement

Students must maintain a cumulative average of 3.0 in all coursework taken for graduate credit. An accumulation of two C grades results in suspension from the Master's program. An accumulation of more than two C grades results in termination of enrollment in the Master's program. If students make a grade of U in any course, enrollment in the program is terminated.

Transfer Credit

Up to 6 hours of transfer credit may be applied to the Master's degree. Only courses with grades of A or B may be accepted for transfer credit. Courses taken to satisfy the requirements of a previously completed degree cannot be counted toward the Master's degree. All transfer credit must be approved by the student's Thesis Committee and the Graduate Program Director.

Departmental Seminars

Graduate students are expected to attend all seminars sponsored by the Department of Biological Sciences.

Student Teaching

Every student must teach at least once. This requirement is satisfied by being a Graduate Teaching Assistant for one course for one semester.

Deadlines/Progression Requirements

- 1) All M.S. students must establish their Supervisory Committee by the end of the 2nd semester. The

Committee must be established before approving the Curriculum Contract and taking the Oral Candidacy exam. For thesis-track students, the Supervisory Committee must also be established before approving the Thesis Proposal.

- 2) The Curriculum Contract must be approved no later than the end of the 2nd semester and preferably by the end of the 1st semester.
- 3) The Oral Candidacy exam must be approved before the beginning of the 3rd semester. All required coursework for the degree, with the exception of the Tutorial requirement for non-thesis track students and Research and Thesis for thesis-track students, must be completed before taking the Candidacy Examination. For thesis-track students, completion of the Candidacy exam must precede approval of the Thesis Proposal.
- 4) For thesis-track students, the Thesis Proposal must be approved before the beginning of the 3rd semester.
- 5) The student is required to meet with their Supervisory Committee at least once a year.

Admission to Candidacy

General academic regulations will apply to admission to candidacy. In addition to these the applicant should have:

- 1) Removed any identified entrance deficiencies by the time of application.
- 2) Successfully completed the Qualifying Examination, which can be taken only after the completion of all required coursework for the degree, with the exception of the Tutorial requirement for the non-thesis track, and Research and Thesis for the thesis-track.
- 3) Taken at least 15 credit hours of graduate work with a GPA of 3.0 or above.
- 4) Satisfied the Supervisory Committee that they are qualified to become a candidate, i.e., can fulfill the requirements successfully.

Assistantships

Teaching and research assistantships are available on a competitive basis for qualified students. A limited number of tuition grants are also competitively awarded. Typically, thesis-track M.S. students are prioritized above non-thesis track students for funding awards.

Graduate Certificate in Biomedical Sciences

The Graduate Certificate in Biomedical Sciences is offered by the Department of Biological Sciences and provides students with core competencies or exposure to areas of study in the biomedical sciences to prepare them for professional biomedical schools, including -- but not limited to -- medical, veterinary, and dental schools. In addition,

certificate students are able to transfer credit hours into the M.S. or Ph.D. in Biology programs should they modify their career goals. Certificate students are able to choose from a number of existing course offerings in the Biology program that expose them to broad areas of anatomy and physiology; biochemical principles and metabolic pathways; microbiology, immunology, and infection; embryology, cell biology, and development.

The 15 required credit hours for the certificate must be completed within four years of study starting from the time the first course is taken. Courses taken for one graduate certificate may not be counted toward another graduate certificate. Up to 6 credit hours of graduate coursework taken as post-baccalaureate status at UNC Charlotte may be applied toward the Graduate Certificate in Biomedical Sciences. Credit hours earned in the certificate program may be applied to the master's or doctoral program in Biology pursued either in conjunction with or after the certificate has been awarded subject to admission to that graduate program.

Admission Requirements

- A bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body
- Minimum GPA of 2.8 (based on a 4.0 scale) on all previous work completed beyond high school (secondary school)
- An online application through the Graduate School's application system
- A statement of purpose
- Unofficial transcripts of all college coursework attempted
- Official and satisfactory scores on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and the applicant has not earned a post-secondary degree from a U.S. institution
- Given that certificates are not degree programs and are intended to provide streamlined educational opportunities, standardized test scores (e.g., GRE, GMAT, MAT) are not required for admission

Certificate Requirements

The Graduate Certificate in Biomedical Sciences requires completion of 15 credit hours of elective courses in biomedical sciences selected from the list below. A maximum of 3 credit hours in BIOL 6901 may be used for the certificate.

- BIOL 5000 - Advanced Topics in Biology (1 to 4)
(Cardiovascular Physiology, Comparative Animal Physiology topics)
 BIOL 5121 - Advanced Biometry (4)

BIOL 5167 - Medical Genetics (3)
 BIOL 5171 - Cell Physiology (3)
 BIOL 5189 - Mechanisms in Development (3)
 BIOL 5199 - Molecular Biology (3)
 BIOL 5233 - Parasitology (3)
 BIOL 5235 - Mammalogy (4)
 BIOL 5250 - Microbiology (3)
 BIOL 5250L - Microbiology Laboratory (1)
 BIOL 5251 - Immunology (3)
 BIOL 5251L - Immunology Laboratory (1)
 BIOL 5254 - Epidemiology (3)
 BIOL 5256 - Pathogenic Bacteriology (3)
 BIOL 5256L - Pathogenic Bacteriology Laboratory (1)
 BIOL 5257 - Microbial Physiology and Metabolism (3)
 BIOL 5258 - Epidemics and Plagues (3)
 BIOL 5259 - Advanced Virology (3)
 BIOL 5259L - Advanced Virology Laboratory (1)
 BIOL 5265 - Drugs: Molecular and Cellular Mechanisms (3)
 BIOL 5277 - Endocrinology (3)
 BIOL 5279 - Neurobiology (3)
 BIOL 5283 - Developmental Biology (3)
 BIOL 5283L - Developmental Biology Laboratory (1)
 BIOL 5292 - Advances in Immunology (3)
 BIOL 5293 - Comparative Vertebrate Anatomy (4)
 BIOL 6000 - Special Topics in Biology (1 to 4) (*Cancer Genetics, Cancer Progression and Metastasis, and Carcinogenesis and Immunity topics*)
 BIOL 6010 - Special Topics in Microbiology (1 to 4)
 BIOL 6101 - Hypothesis Testing (3)
 BIOL 6102 - Cell and Molecular Biology (3)
 BIOL 6103 - Immunology of Infection (4)
 BIOL 6104 - Integrative Systems Physiology (4)
 BIOL 6270 - Biological Pathways and Metabolism (3)
 BIOL 6273 - Advanced Human Physiology (3)
 BIOL 6274 - Advanced Human Pathophysiology (3)
 BIOL 6901 - Laboratory Research (1 to 2)

Certificate Total = 15 Credit Hours

Grade Requirements

The Certificate in Biomedical Sciences is awarded upon completion of the courses for 15 or more credit hours, with a cumulative GPA of 3.0 or higher. Only one grade of C may be counted toward the certificate.

Requests for related courses and substitutions may be approved at the discretion of the Certificate Director and Graduate Program Director and Coordinator.

Graduate Certificate in Biotechnology

The Graduate Certificate in Biotechnology offered by the Department of Biological Sciences is a multi-disciplinary program designed to combine advanced discipline-specific

coursework with activities that develop those communication and technical skills that are highly valued by employers in the biotechnology industry. Successful completion of the certificate program provides students with a solid foundation for success through practical experience gained via internships in laboratories on campus or in local industry. The certificate program also cultivates an awareness of ethical, policy, and management issues related to the biotechnology industry. The faculty and staff of the certificate program assist students toward achieving their greatest academic, personal, and professional potential through quality courses and instruction. In addition, the certificate program helps meet the employment needs of biotechnology laboratories and provide quality continuing education to laboratory professionals in our service area.

Admission Requirements

- A bachelor's degree, or its equivalent, from a college or university accredited by an accepted accrediting body
- Evidence of sufficient undergraduate preparation in biology with a minimum of 12 credit hours in biology
- A minimum of 12 credit hours of related study (preferably at least one semester of Organic Chemistry and one semester of Statistics)
- GPA of at least 2.8 (based on a 4.0 scale) on all previous complete work beyond high school (secondary school)
- An online application through the Graduate School's application system
- A statement of purpose
- Unofficial transcripts of all college coursework attempted
- Official and satisfactory scores on the Test of English as a Foreign Language Test (TOEFL) or the International English Language Testing System (IELTS), if English is not the applicant's native language and if the applicant has not earned a post-secondary degree from a U.S. institution

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Certificate Requirements

The Graduate Certificate in Biotechnology requires 15 credit hours of courses that must be completed within four years of study starting from the time the first course is taken. Courses taken for one graduate certificate may not be counted toward another graduate certificate. Up to 6 credit hours of graduate coursework taken as post-baccalaureate status at UNC Charlotte may be applied toward the certificate. Credit hours earned in the certificate program may be applied to the master's or doctoral program in Biology pursued either in conjunction with or after the certificate has been awarded subject to

admission to that graduate program. Requests for related courses and substitutions may be approved at the discretion of the Certificate Director and Graduate Program Director and Coordinator.

Biological Sciences Courses (9 credit hours)

Select from the following:

BIOL 5162 - Advanced Biotechnology I (3)
 BIOL 5163 - Advanced Biotechnology II (3)
 BIOL 5167 - Medical Genetics (3)
 BIOL 5168 - Recombinant DNA Techniques (4)
 BIOL 5171 - Cell Physiology (3)
 BIOL 5184 - Plant Biotechnology (3)
 BIOL 5250 - Microbiology (3)
 BIOL 5250L - Microbiology Laboratory (1)
 BIOL 5251 - Immunology (3)
 BIOL 5253 - Marine Microbiology (4)
 BIOL 5254 - Epidemiology (3)
 BIOL 5255 - Bacterial Genetics (3)
 BIOL 5256 - Pathogenic Bacteriology (3)
 BIOL 5256L - Pathogenic Bacteriology Laboratory (1)
 BIOL 5259 - Advanced Virology (3)
 BIOL 5259L - Advanced Virology Laboratory (1)
 BIOL 5265 - Drugs: Molecular and Cellular Mechanisms (3)
 BIOL 5292 - Advances in Immunology (3)
 BIOL 6101 - Hypothesis Testing (3)
 BIOL 6241 - Environmental Biology (3)
 BIOL 6270 - Biological Pathways and Metabolism (3)
 BIOL 6366 - Advanced Protein Biotechnology (3)

Bioinformatics and Chemistry Courses (3 credit hours)

Select from the following:

BINF 5171 - Business of Biotechnology (3)
 BINF 5191 - Life Sciences and the Law (3)
 BINF 6200 - Statistics for Bioinformatics (3)
 BINF 6201 - Molecular Sequence Analysis (3)
 BINF 6203 - Genomics (3)
 CHEM 5090 - Special Topics in Chemistry (1 to 4)
 (NanoBiochemistry)

Seminar Course (1 credit hour)

BIOL 6600 - Seminar (1 to 2)

Research Internship (2 credit hours)

Participate in 2 credit hours of a biotechnology-based research internship:

BIOL 6901 - Laboratory Research (1 to 2)

Certificate Total = 15 Credit Hours

Grade Requirements

A minimum cumulative GPA of 3.0 in all courses is required. Only one grade of C may be counted toward the certificate.

CHEMISTRY

- M.S. in Chemistry
- Ph.D. in Chemistry and Nanoscale Science (*see individual Nanoscale Science section*)

Department of Chemistry

chemistry.charlotte.edu

M.S. in Chemistry

The Department of Chemistry offers a research-based Master of Science (M.S.) degree, which provides the background necessary for further graduate or professional studies in the physical, life or medical sciences or a career in chemistry. The M.S. degree also provides students a foundation in nanoscale science, an extension of chemistry that addresses the development, manipulation, and utility of materials and devices on the scale of roughly 1-100 nanometers in length, and the study of phenomena that occur on this size scale. The degree requires a minimum of 30 credit hours and a capstone experience. For students entering the M.S. program thesis track, the capstone experience will involve defending a thesis based on original research carried out under the direction of a member of the graduate faculty. Students enrolled in the non-thesis track will complete a comprehensive exam to demonstrate their mastery of chemistry and nanoscale science. UNC Charlotte B.S. degree chemistry majors may elect to participate in the five-year Accelerated Early Entry M.S. program (described in the *UNC Charlotte Undergraduate Catalog*).

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Chemistry:

- 1) Administration of placement examinations by the department each semester just prior to registration as an aid in identifying academic deficiencies
- 2) Removal of any deficiencies within one year
- 3) International students must meet published University standards on English proficiency

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog*

for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

Students in this program must complete a minimum of 30 credit hours, including at least 15 credit hours in 6000-level courses open to graduate students only.

Students in the M.S. in Chemistry program are required to be non-deficient in four out of five sub-disciplines of chemistry (inorganic chemistry, organic chemistry, physical chemistry, biochemistry, instrumental/analytical chemistry) as determined by five placement exams prior to the beginning of classes during the first enrolled semester. Students must not be deficient in organic chemistry, physical chemistry, and two other sub-disciplines of their choice. Deficiencies may be removed by passing the placement exam at the beginning of the subsequent semester or by passing a graduate level course with a grade B or above.

To obtain the required 30 credit hours for graduation, students may choose additional credit hours in Research and Thesis or Elective Courses.

All courses must be taken within seven years of admission to the program.

Required Courses

Students enrolled in only the M.S. program will be automatically assigned to the thesis research track option. Students co-enrolled in both the M.S. in Chemistry program and the Ph.D. in Chemistry and Nanoscale Science program have the option of pursuing a non-thesis M.S. option.

Thesis Research Track Option

Students pursuing the thesis research track option must complete the following courses:

CHEM 6681 - Research Seminar (1)
CHEM 6682 - Research Seminar (1)
CHEM 6900 - Research and Thesis (1 to 16)

Non-Thesis Track Option

Students enrolled in the non-thesis track option must complete the following courses:

NANO 8203 - Collaborative Research Proposal (3)
NANO 8682 - Nanoscale Science Colloquium (1)

Elective Courses

A minimum of 6 credit hours from the following courses is required. Additional credits may be taken to satisfy the 30 credit hours.

CHEM 6060 - Special Topics and Investigations (1 to 3)*
CHEM 6069 - Topics in Biochemistry (3)

CHEM 6101 - Biochemical Principles (4)
CHEM 6115 - Advanced Analytical Chemistry (3)
CHEM 6126 - Organometallic Chemistry (3)
CHEM 6135 - Advanced Organic Chemistry (3)
CHEM 6147 - Molecular Photochemistry and Photophysics (3)
CHEM 6150 - Seminar-Internship (1 to 3)
CHEM 6155 - Polymer Synthesis (3)
CHEM 6165 - Advanced Biochemistry (3)
CHEM 6900 - Research and Thesis (1 to 16)
MEGR 6109 - Biotechnology and Bioengineering (3)
NANO 8001 - Perspectives at the Nanoscale (2)
NANO 8101 - Introduction to Instrumentation and Processing at the Nanoscale (3)
NANO 8102 - Nanoscale Phenomena (3)
NANO 8103 - Synthesis and Characterization of Nanomaterials (3)
NANO 8105 - Life at the Nanoscale (3)
NANO 8203 - Collaborative Research Proposal (3)
NANO 8301 - Nanomedicine (3)
NANO 8351 - Nanoscale Materials for Energy Applications (3)

**Departmental approval is necessary before CHEM 6060 credit can be used to satisfy this requirement.*

***Any 5000 level or higher Biology, Engineering, Chemistry and Nanoscale Science, Mathematics or Physics course, except those designed for a professional education sequence, may be taken for graduate credit upon departmental approval.*

Capstone Requirement

M.S. Degree: Thesis Track

A thesis must be written and defended within seven calendar years after admission into the M.S. program as a degree student. The written thesis is defended before the department and a special thesis committee of no fewer than four persons, with at least one member from outside of the Department of Chemistry.

M.S. Degree: Non-Thesis Track

Students in the non-thesis track option must pass a comprehensive exam.

Students enrolled in the M.S. non-thesis track will be co-enrolled in the Ph.D. program in Chemistry and Nanoscale Science. The student's preliminary dissertation committee for the Ph.D. program shall also serve as the student's advisory committee for the M.S. degree non-thesis track program. The M.S. comprehensive exam will be written by the student's advisory committee, and the subject matter for the exam will be based on the student's coursework and proposed dissertation topic. Students begin the comprehensive exam process by submitting a dissertation topic proposal to their advisory committee. Within two weeks after the proposal is submitted, the committee will

provide the student with a written comprehensive exam. The student shall have one week to complete the exam.

Students are encouraged to complete the comprehensive exam prior to the start of their fifth semester in residence.

A student that fails the comprehensive exam, may take it one more time. Note that a student does not need to pass the dissertation topic proposal oral defense to pass the comprehensive exam.

Degree Total = 30 Credit Hours

Grade Requirements

Students in the M.S. in Chemistry program are required to maintain satisfactory progress toward the degree. Continued enrollment is at all times subject to review on the basis of academic record. This review is performed by the departmental Graduate Committee.

A GPA of 3.0 is required for the degree. An accumulation of two marginal (C) grades or one unsatisfactory (U) grade on the graduate transcript results in termination of the student's enrollment in the M.S. in Chemistry program and a termination of any assistantships and fellowships they were receiving.

Advising

Approval of the program of each student and monitoring their progress toward the degree is the responsibility of the student's research advisor. Prior to the selection of a research advisor, graduate student progress is monitored by the departmental Graduate Committee.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar.

Research Experiences

Chemistry faculty offer research opportunities in all areas of molecular and nanoscale sciences, and many participate in formal or informal interdisciplinary research programs. Faculty research interests include computational chemistry, organic synthesis, polymer chemistry, organometallic chemistry, structural and mechanistic organic chemistry, electrochemistry, materials and interfacial chemistry, catalysis, biochemistry, biophysical chemistry, analytical separations, bioanalytical chemistry, mass spectrometry, and chemical education. Many chemistry faculty are active participants in interdisciplinary research projects in biotechnology and biomedicine, optical science, materials science, or electrical engineering. Students receive academic credit for their research and benefit from a low student-to-faculty ratio. Graduate

students are assigned individual projects and work closely with faculty members to build their own, original contribution to the scientific literature. Students have full access to and receive excellent training in the use of any departmental instrumentation needed to carry out their research. Results are presented at informal seminars, scientific conferences, and in articles published in high-quality, refereed journals. Research in the Department is funded in part from competitive grants obtained from agencies such as the American Chemical Society, National Science Foundation, National Institutes of Health, DoD, DoE, Research Corporation, Dreyfus Foundation, North Carolina Biotechnology Center, UNC Charlotte Foundation, and private industry.

Assistantships

Graduate students generally support their education through teaching or research assistantships available through the Department of Chemistry. The department also sponsors the Thomas Walsh Research Fellowship, which provides significantly greater support to one highly qualified applicant. Tuition waivers covering state tuition are also available to external applicants through the Thomas Walsh Tuition Fellowships. Many faculty may offer research assistantships to qualified students. Further information is available in the department. Support in the summer months may also be available.

Tuition Waivers

Fellowships are available for students enrolled in the M.S. in Chemistry program and for students seeking an interdisciplinary doctoral degree through the Department of Chemistry. Further information is available in the department.

MATHEMATICS AND STATISTICS

- **Ph.D. in Applied Mathematics**
- **Ph.D. in Curriculum and Instruction: Mathematics Education Concentration**
(see *College of Education* section)
- **M.S. in Mathematics**
 - General Mathematics
 - Applied Mathematics
 - Mathematics Education
 - Actuarial Statistics
 - Applied Statistics
- **M.S. in Mathematical Finance**
(see *Belk College of Business* section)

Department of Mathematics and Statistics
math.charlotte.edu

Ph.D. in Applied Mathematics

The Ph.D. degree program in Applied Mathematics is designed to enable its students to master a significant body of mathematics; to relate this knowledge to a coherent area of science or engineering; and to carry on fundamental research in mathematics at a nationally competitive level. The Statistics Concentration of the Ph.D. in Applied Mathematics addresses the growing demand for expertise in statistical theory, data science, and quantitative analysis. It emphasizes both theoretical foundations and data-driven methodologies, preparing graduates for leadership roles in research, decision-making, and innovation across academia, industry, and government sectors.

Recipients of the Ph.D. degree will, depending on their abilities and choice of sub-specialty, be able to work effectively in research and development environments involving mathematical and statistical analysis and modeling in business, government or industry, to teach mathematics and/or statistics at the college or university level, or to carry out fundamental research in their area of expertise.

For further information, please see the Department of Mathematics and Statistics website at <http://math.charlotte.edu/>.

Admission Requirements

Applicants will be evaluated in a holistic manner to identify those who have the greatest potential to complete the program. In addition to the general requirements for admission to the Graduate School, to begin study toward the Ph.D. in Mathematics, students admitted to the program should have:

1. A B.S. or B.A. degree in mathematics or statistics or a closely related field from a college or university accredited by an accepted accrediting body.
2. An overall grade point average of at least 3.0 out of 4.0.
3. A minimum of 27 credit hours in mathematics and/or statistics at the undergraduate level, as approved by the department Graduate Committee, with grades of a C or above. These typically include 12 credit hours of calculus at the level of MATH 1241, MATH 1242, MATH 2241, and MATH 2242; 3 credit hours of linear algebra at the level of MATH 2164; and 3 credit hours of differential equations at the level of MATH 2171. For admission to the Ph.D. in Applied Mathematics program, these also include 6 credit hours of proof-based analysis courses at the level of MATH 3141 and MATH 3142 and 3 credit hours of modern abstract algebra at the level of MATH 3163, while for admission to the Ph.D. in Applied Mathematics with a Concentration in Statistics program, these also include 6 credit hours of probability and statistics at the level of STAT 3122 and STAT 3123 and 3 credit hours of analysis at the level of MATH 3141. In addition, admission requires that the candidate be able to take MATH 8143 or be able to take MATH 5143 and have other factors in their record that indicate strong potential to complete the program.
4. A score of at least 83 on the Internet-based Test of English as a Foreign Language (TOEFL), or an overall band score of at least 6.5 on the International English Language Testing System (IELTS), or a score of at least 115 on the Duolingo English Test, for applicants whose native language is not English. To be considered official, the score must be sent directly from the testing agency to UNC Charlotte.
5. Three letters of reference, at least two of which must be from faculty members.
6. A score on the GRE General Test or the GMAT with a quantitative score of at least 70th percentile. To be considered official, the score must be sent directly from the testing agency to UNC Charlotte. However, there are two exceptions:
 - A student who has already earned a Ph.D.,

M.D., or J.D. from a U.S. institution will not be required to submit a GRE General Test or GMAT score.

- A student who has already earned a Master's degree from a U.S. institution will not be required to submit a GRE General Test or GMAT score IF the student can demonstrate that they have completed the test in the past. In such cases, the program will accept the official student's copy of the official test scores.

For prospective students who have completed work in mathematics and/or statistics beyond the bachelor's degree, performance on that work will be considered in admission decisions. Candidates with relevant research experience and professional publications will be given priority consideration.

Students are admitted to the program by the Graduate School, based on the recommendation of the department Graduate Committee or its designate, the Graduate Program Director. Recommendations are based on the Committee's judgment of the candidate's ability to complete the program, as supported by the application materials. The department may waive certain admission requirements if it judges the candidate to be nonetheless capable of completing the program.

Degree Requirements

Students in the Ph.D. in Applied Mathematics program must maintain satisfactory academic progress towards completion of the degree. Student satisfactory academic progress is primarily assessed by: (a) satisfactory coursework performance, (b) the qualifying examination, and (c) a dissertation. The students must complete an approved program of study of 54 credit hours, including the following:

Research and Ethics Courses

Students should complete the following courses in the first year of their program.

GRAD 8302 - Responsible Conduct of Research (2)
GRAD 8990 - Academic Integrity (0)

Required Courses and Dissertation (24 credit hours)

Students must complete 18 hours of Doctoral Research and Reading credit.

MATH 8143 - Real Analysis I (3)
MATH 8144 - Real Analysis II (3)
MATH 8994 - Doctoral Research and Reading (0 to 9) (*at least 18 research credit hours*)

Breadth Elective Courses (9 credit hours)

Students must complete either (a) 1 course from Group I and 2 courses from Group II, or (b) 2 courses from Group I and 1 course from Group II:

Group I

MATH 5163 - Modern Algebra (3)
MATH 5181 - Introduction to Topology (3)
MATH 8141 - Complex Analysis I (3)

Group II

MATH 5128 - Applied Probability I (3)
MATH 5165 - Numerical Linear Algebra (3)
MATH 5174 - Partial Differential Equations (3)

Depth Elective Courses (9 credit hours)

Students must complete at least 9 additional credit hours in 8000-level MATH courses, excluding MATH 8490, MATH 8891, MATH 8892, MATH 8994, and MATH 8999.

MATH 8028 - Topics in Probability (3)
MATH 8050 - Topics in Mathematics (2 to 3)
MATH 8065 - Topics in Applied Algebra and Algebraic Structures (3)
MATH 8070 - Topics in Numerical Analysis (3)
MATH 8071 - Topics in Differential Equations (3)
MATH 8120 - Probability Theory I (3)
MATH 8121 - Probability Theory II (3)
MATH 8125 - Stochastic Processes I (3)
MATH 8126 - Stochastic Processes II (3)
MATH 8141 - Complex Analysis I (3)
MATH 8147 - Applied Functional Analysis (3)
MATH 8148 - Functional Analysis (3)
MATH 8163 - Modern Algebra I (3)
MATH 8164 - Modern Algebra II (3)
MATH 8172 - Partial Differential Equations (3)
MATH 8175 - Inverse Problems (3)
MATH 8176 - Advanced Numerical Analysis (3)
MATH 8177 - Applied Optimal Control (3)
MATH 8181 - Topology I (3)
MATH 8182 - Topology II (3)
MATH 8184 - Differential Geometry I (3)
MATH 8203 - Stochastic Calculus for Finance (3)
MATH 8204 - Computational Methods for Asset Pricing (3)
MATH 8273 - Advanced Finite Element Analysis (3)
MATH 8275 - Dynamical Systems I (3)
MATH 8276 - Dynamical Systems II (3)

Elective Courses (12 credit hours)

Students must complete at least 3 credit hours from the following MATH courses. Students are encouraged to include interdisciplinary elective courses in their program of study. These courses are generally expected to be in STEM disciplines, see examples below; however, courses in the social sciences may also be included if they are directly relevant to a student's dissertation work. While students may take more than three interdisciplinary electives, a maximum of 9 credit hours from such courses will count toward the 54 credit hours required for the degree.

Computer Science

ITCS 8114 - Algorithms and Data Structures (3)
 ITCS 8115 - Advanced Topics in Algorithms and Data Structures (3)
 ITCS 8150 - Intelligent Systems (3)
 ITCS 8155 - Knowledge-Based Systems (3)
 ITCS 8156 - Machine Learning (3)
 ITCS 8165 - Coding and Information Theory (3)

Economics and Finance

Any ECON or FINN courses listed under the M.S. in Mathematical Finance program. - Examples include:

ECON 5161 - Game Theory (3)
 ECON 6112 - Graduate Econometrics (3)
 ECON 6113 - Cross-Section and Time-Series Econometrics (3)
 ECON 6218 - Advanced Business and Economic Forecasting (3)
 ECON 6219 - Financial Econometrics (3)
 FINN 6203 - Financial Economic Theory (3)
 FINN 6210 - Financial Elements of Derivatives (3)
 FINN 6211 - Fixed Income Securities and Credit Risk (3)

Mathematics

Any 8000-level MATH course, including MATH 8994-Doctoral Research and Reading, and the following lower level courses:

MATH 5128 - Applied Probability I (3)
 MATH 5129 - Applied Probability II (3)
 MATH 5143 - Analysis I (3)
 MATH 5144 - Analysis II (3)
 MATH 5161 - Number Theory (3)
 MATH 5163 - Modern Algebra (3)
 MATH 5164 - Abstract Linear Algebra (3)
 MATH 5165 - Numerical Linear Algebra (3)
 MATH 5172 - The Finite Element Method (3)
 MATH 5173 - Ordinary Differential Equations (3)
 MATH 5174 - Partial Differential Equations (3)
 MATH 5176 - Numerical Methods for Partial Differential Equations (3)
 MATH 5181 - Introduction to Topology (3)

Mechanical Engineering

MEGR 8113 - Dynamics and Thermodynamics of Compressible Flow (3)
 MEGR 8141 - Theory of Elasticity I (3)
 MEGR 8142 - Theory of Elasticity II (3)
 MEGR 8143 - Inelastic Behavior of Materials (3)

Optics

OPTI 8101 - Mathematical Methods of Optical Science and Engineering (3)
 OPTI 8102 - Principles of Geometrical Optics (3)
 OPTI 8104 - Electromagnetic Waves (3)
 OPTI 8105 - Optical Properties of Materials (3)

OPTI 8211 - Introduction to Modern Optics (3)

Physics

PHYS 5222 - Classical Mechanics II (3)
 PHYS 5232 - Electromagnetic Theory II (3)
 PHYS 5242 - Modern Physics II (3)
 PHYS 5271 - Waves and Optics (3)
 PHYS 6108 - Biophysics (3)
 PHYS 6131 - Classical Electromagnetism I (3)
 PHYS 6141 - Quantum Theory I (3)
 PHYS 6142 - Quantum Theory II (3)
 PHYS 6181 - Advanced Solid State Physics (3)
 PHYS 6204 - Methods of Molecular Modeling and Simulation in Physics (3)
 PHYS 6210 - Theoretical Physics (3)
 PHYS 6211 - Introduction to Modern Optics (3)
 PHYS 6221 - Optical Communications I (3)
 PHYS 6251 - Statistical Physics (3)

Statistics

STAT 5123 - Applied Statistics I (3)
 STAT 5124 - Applied Statistics II (3)
 STAT 6113 - Cross-Section and Time-Series Econometrics (3)
 STAT 6115 - Statistical Learning with Big Data (3)
 STAT 8027 - Topics in Statistics (3)
 STAT 8116 - Theory of Statistics I (3)
 STAT 8117 - Theory of Statistics II (3)
 STAT 8122 - Advanced Statistics I (3)
 STAT 8123 - Advanced Statistics II (3)
 STAT 8127 - Linear Statistical Models (3)
 STAT 8133 - Multivariate Analysis (3)
 STAT 8135 - Statistical Computation (3)
 STAT 8137 - Survival Analysis (3)
 STAT 8139 - Time Series Analysis (3)

Degree Total = 54 Credit Hours**Degree Requirements, Statistics Concentration**

Students in the Ph.D. in Applied Mathematics with a Concentration in Statistics program must complete an approved program of study of 54 credit hours, including the following:

Research and Ethics Courses

Students should complete the following courses in the first year of their program.

GRAD 8302 - Responsible Conduct of Research (2)
 GRAD 8990 - Academic Integrity (0)

Required Courses and Dissertation (42 credit hours)

Students must complete 18 hours of Doctoral Research and Reading credit.

MATH 8120 - Probability Theory I (3)
 MATH 8143 - Real Analysis I (3)
 MATH 8994 - Doctoral Research and Reading (0 to 9)

STAT 5123 - Applied Statistics I (3)
 STAT 5124 - Applied Statistics II (3)
 STAT 8116 - Theory of Statistics I (3)
 STAT 8117 - Theory of Statistics II (3)
 STAT 8127 - Linear Statistical Models (3)
 STAT 8135 - Statistical Computation (3)

Restricted Elective Courses (6 credit hours)

Students must complete two courses from the following MATH/STAT courses:

MATH 5128 - Applied Probability I (3)
 STAT 6115 - Statistical Learning with Big Data (3)
 STAT 8133 - Multivariate Analysis (3)
 STAT 8137 - Survival Analysis (3)
 STAT 8139 - Time Series Analysis (3)

Elective Courses

Students are encouraged to include interdisciplinary elective courses in their program of study. These courses are generally expected to be in STEM disciplines; however, courses in the social sciences may also be included if they are directly relevant to a student's dissertation work. While students may take more than two interdisciplinary electives, a maximum of 6 credit hours from such courses will count toward the 54 credit hours required for the degree. Examples of elective courses allowed for several fields include:

Computer Science

ITCS 8115 - Advanced Algorithms (3)
 ITCS 8150 - Artificial Intelligence (3)
 ITCS 8155 - Knowledge-Based Systems (3)
 ITCS 8156 - Machine Learning (3)
 ITCS 8165 - Coding and Information Theory (3)

Economics and Finance

Any ECON or FINN courses listed under the Mathematical Finance, M.S. program. Examples include:

ECON 5161 - Game Theory (3)
 ECON 6112 - Graduate Econometrics (3)
 ECON 6113 - Cross-Section and Time-Series Econometrics (3)
 ECON 6218 - Advanced Business and Economic Forecasting (3)
 ECON 6219 - Financial Econometrics (3)
 FINN 6203 - Financial Economic Theory (3)
 FINN 6210 - Financial Elements of Derivatives (3)
 FINN 6211 - Fixed Income Securities and Credit Risk (3)

Mathematics and Statistics

MATH 5128 - Applied Probability I (3)
 MATH 5129 - Applied Probability II (3)
 MATH 5143 - Analysis I (3)
 MATH 5144 - Analysis II (3)
 MATH 5161 - Number Theory (3)
 MATH 5163 - Modern Algebra (3)
 MATH 5164 - Abstract Linear Algebra (3)

MATH 5165 - Numerical Linear Algebra (3)
 MATH 5172 - The Finite Element Method (3)
 MATH 5173 - Ordinary Differential Equations (3)
 MATH 5174 - Partial Differential Equations (3)
 MATH 5176 - Numerical Methods for Partial Differential Equations (3)
 MATH 5181 - Introduction to Topology (3)
 Any MATH 8000-level course
 STAT 6113 - Cross-Section and Time-Series Econometrics (3)
 STAT 6115 - Statistical Learning with Big Data (3)
 STAT 8027 - Topics in Statistics (3)
 STAT 8122 - Advanced Statistics I (3)
 STAT 8123 - Advanced Statistics II (3)
 STAT 8133 - Multivariate Analysis (3)
 STAT 8137 - Survival Analysis (3)
 STAT 8139 - Time Series Analysis (3)
 STAT 8490 - Industrial Internship (0 to 6)
 STAT 8891 - Independent Study in Statistics (1 to 3)

Degree Total = 54 Credit Hours

Qualifying Examination

After being admitted to the Ph.D. program, students are expected to take the qualifying examination within three semesters. This time limit may be extended for up to two additional semesters in certain cases, depending on the background of the student and with program approval.

The qualifying examination for the Ph.D. in Applied Mathematics consists of the following two parts.

- Part I: A written examination based on Real Analysis I and II (MATH 8143 and MATH 8144).
- Part II: A written examination based on two other courses chosen by the student to be specifically related to the student's intended specialty and approved by the department Graduate Committee. The two courses must have a central theme. Typical choices include MATH 5128/MATH 5129 (Probability), MATH 5163/ MATH 5164 (Algebra), MATH 5173/ MATH 5174 (Differential Equations), MATH 5165/ MATH 5172 (Numerical Analysis), MATH 5172/ MATH 5176 (Numerical PDE), MATH 5174/ MATH 8172 (Partial Differential Equations), and MATH 8275/ MATH 8276 (Dynamical Systems).

The qualifying examination for the Ph.D. in Applied Mathematics with a Concentration in Statistics consists of the following two parts.

- Part I: A written examination based on Theory of Statistics I and II (STAT 8116 and STAT 8117).
- Part II: A written examination based on Applied Statistics I and II (STAT 5123 and STAT 5124).

Students may be allowed to retake a part of the qualifying examination a second time if they do not pass that part on the first attempt within the guidelines of the Graduate

School regulations pertaining to the qualifying examination and as overseen by the department Graduate Committee. Students must pass the qualifying examination by the end of the 5th semester of study. Students who do not complete the qualifying examination as per the regulations of the Graduate School are terminated from the Ph.D. program.

Dissertation

Students must complete and defend a dissertation based on a research program approved by their dissertation committee which results in a high quality, original and substantial piece of research.

Dissertation Committee

Each student has a dissertation committee appointed by the department Graduate Committee in consultation with the student and approved by the Dean of the Graduate School. A dissertation committee must consist of at least four graduate faculty members, including the Graduate Faculty Representative appointed by the Graduate School. The committee is typically chaired by the student's dissertation advisor. If the dissertation advisor is a graduate faculty member from an outside department or institution, a graduate faculty member from the Department of Mathematics and Statistics must be a co-chair of the committee. The dissertation committee should be appointed as soon as is feasible, usually within a year after passing the qualifying examination. Prior to the appointment of the dissertation committee the student is advised by a graduate faculty member appointed by the department Graduate Committee.

Topic Approval Defense and Admission to Candidacy

After a student completes the qualifying examination and advanced coursework, the student, in consultation with the student's dissertation advisor, may propose a dissertation topic. The dissertation topic proposal must be articulated and defended at a meeting of the student's dissertation committee. A written dissertation proposal must be submitted to the dissertation committee at least two weeks prior to the scheduled defense. The student is expected during the course of the topic defense to outline and demonstrate sufficient proficiency with the advanced knowledge and techniques to be used in the conduct of the research. The topic approval defense and the committee's deliberations in this regard are to be conducted according to the pertinent regulations of the Graduate School. A doctoral student advances to candidacy after the student's dissertation committee and the Dean of the Graduate School have approved the dissertation topic proposal. A student may retake the dissertation topic approval defense if they fail the first time. The second failed attempt will result in the termination of the student's enrollment in the Ph.D. program.

Final Defense

A student must orally present and successfully defend the dissertation before the student's doctoral dissertation committee in a defense that is open to the public. A working copy of the dissertation must be made available to each member of the student's dissertation committee at least three weeks prior to the public defense, and along with the dissertation, the student must share their iThenticate similarity report with the committee. A copy of the dissertation must be made available to the graduate faculty of the department at least two weeks prior to the public defense. The final defense and the committee's deliberations in this regard are to be conducted according to the pertinent regulations of the Graduate School: All members of the committee, including the Graduate Faculty Representative, must attend the defense; the decision of the committee is final; in the rare event of a split decision, typically the committee members come to an agreement as to whether the student defense is acceptable; it is the responsibility of the committee chair to work within their ability to resolve any impasse among committee members; if no resolution is feasible, then the chair should consult with the Graduate School; and no student is permitted to take the final dissertation defense more than twice.

Grade Requirements

Students are expected to achieve As or Bs in all courses included in the program of study and must maintain a minimum 3.0 GPA to graduate. An accumulation of more than two marginal (C) grades will result in suspension of the student's enrollment in the program. If students make a grade of U on any course, enrollment will be suspended and students cannot take further graduate work without being readmitted to the program. Readmission to the program requires approval of the Dean of the Graduate School upon the recommendation of the department Graduate Committee.

Residency Requirement

Full-time Ph.D. students must enroll for one continuous full-time year (i.e., two consecutive semesters of at least nine graduate credit hours in each semester) following admission to the program.

Time Limit for Degree Completion

Students must achieve admission to candidacy within six years after admission to the program and complete all requirements within six years after admission to candidacy for the Ph.D. degree. All requirements for the degree must

be completed within nine years after first registration as a doctoral student.

Transfer Credit and Credit by Exam

Only courses with grades of A or B may be accepted for transfer credit. Transfer credit must be recommended by the department Graduate Committee and approved by the Dean of the Graduate School. The amount of transfer credit cannot exceed the limit set by the Graduate School. Students who, because of their previous undergraduate and/or graduate work or other experience, can demonstrate sufficient knowledge of the material in one or more of the core, breadth, depth, or restrictive elective courses may be exempted from taking a course or courses by competence tests or credits by exam. Exemption from a course by a competence test carries no credit towards the degree.

Dual Enrollment in Ph.D. and M.S. Degrees

Ph.D. students may choose to pursue a M.S. in Mathematics degree while continuing to work toward the doctoral degree. Doctoral students can apply for enrollment in the M.S. program after entering the Ph.D. program.

Teaching Assistant Training

Students receiving a teaching assistantship are required to complete the one-credit hour course MATH 6690 - Graduate Teaching Assistant Training. This credit hour does not count toward the 54 credit hours required for the degree. Students with prior college teaching experience as an instructor of record may request a waiver of this requirement.

MATH 6690 - Graduate Teaching Assistant Training (1)

Ph.D. in Curriculum and Instruction: Mathematics Education Concentration

The department also offers a Mathematics Education concentration to students enrolled in the Ph.D. program in Curriculum and Instruction in the College of Education. For details, please see the Curriculum and Instruction degree information located in the College of Education section of this *Catalog*.

M.S. in Mathematics

The Master of Science in Mathematics degree is organized into five concentrations.

The **Concentration in General Mathematics** is a robust but flexible program that allows a student to develop a broad background in Mathematics ranging over a variety of courses chosen from both pure and applied areas, or to tailor a program toward a particular focus that may not be as closely covered by the department's other degree concentrations (e.g., one that is interdisciplinary in nature).

The **Concentration in Applied Mathematics** develops analytical and computational skills focused toward applications of mathematics in the physical sciences as encountered in industry, government, and academia.

The **Concentration in Mathematics Education** is designed primarily for secondary school mathematics teachers interested in professional growth in mathematics teaching. Emphasis in this program is given to developing depth and breadth in mathematics teaching and learning, appropriate to the role of the secondary school teacher.

The **Concentration in Actuarial Statistics** provides advanced skills and knowledge to individuals seeking actuarial careers in insurance and financial institutions.

The **Concentration in Applied Statistics** provides theoretical understanding of, and training in, statistical analysis and methods applicable to particular areas of business, industry, government, and academia.

Admission Requirements

For general requirements for admission to The Graduate School, see The Graduate School section of this Catalog.

All applicants, regardless of which concentration is chosen, are required to take the GRE General Test or the GMAT and have their test scores sent directly from the testing agency to the Office of Graduate Admissions at UNC Charlotte. However, there are two exceptions:

- 1) A student who has already earned a Ph.D., M.D., or J.D. from a U.S. institution will not be required to take a standardized test.
- 2) A student who has already earned a Master's degree from a U.S. institution will not be required to take a standardized test if the student can demonstrate that they have completed the test in the past. In such cases, the program will accept the official student's copy of the official test scores (note that a photocopy is not acceptable) or an official university transcript on which the scores are printed or a letter on official university letterhead attesting to the score.

Each concentration within the M.S. in Mathematics has its own additional admission requirements listed below.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

All candidates, regardless of which concentration is chosen, are required to take two courses in mathematical or statistical analysis.

Concentration in General Mathematics

The Master of Science in Mathematics with Concentration in General Mathematics program is designed both to provide advanced skills and knowledge for persons seeking positions in industry, government, or teaching at the community college level, and to provide professional development to persons currently in such positions. Qualified graduates are also prepared to enter directly into at least the second year of a Ph.D. program in mathematics, applied mathematics, or statistics, depending on the particular course of study.

Additional Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for the concentration in General Mathematics:

- 1) Applicants must present evidence of the satisfactory completion of at least 27 credit hours of mathematics approved by the department Graduate Committee.
- 2) It is recommended that the student have a basic knowledge of at least two of the areas of algebra, analysis, and topology.

Concentration Requirements

The M.S. in Mathematics with Concentration in General Mathematics degree requires successful completion of at least 30 credit hours of graduate work approved by the department Graduate Committee, including: MATH 5143 and MATH 5144 or their equivalents; at least one course each from two of the groups I, II, III, V, and VI below; and at least 15 credit hours in 7000-level courses. No credit shall be given for 6000-level math courses other than mathematical finance courses in group V. With the approval of the department Graduate Committee, a 3 credit hour 6000-level course in another department of a theoretical nature or a 3 credit hour 6000-level mathematical finance course may be applied toward the

15 credit hours in the 7000-level courses. Candidates for the degree concentration must demonstrate, to the satisfaction of the department Graduate Committee, competence on general knowledge in at least three of six groups of courses listed below. This may be accomplished by (a) successful performance on a written or oral comprehensive examination or (b) successful completion of courses in these areas.

Group I - Applied Mathematics

MATH 5165 - Numerical Linear Algebra (3)
 MATH 5172 - The Finite Element Method (3)
 MATH 5173 - Ordinary Differential Equations (3)
 MATH 5174 - Partial Differential Equations (3)
 MATH 5176 - Numerical Methods for Partial Differential Equations (3)
 MATH 7070 - Topics in Numerical Analysis (3)
 MATH 7071 - Topics in Differential Equations (3)
 MATH 7172 - Partial Differential Equations (3)
 MATH 7176 - Advanced Numerical Analysis (3)
 MATH 7177 - Applied Optimal Control (3)
 MATH 7273 - Advanced Finite Element Analysis (3)

Group II - Probability-Statistics

STAT 5123 - Applied Statistics I (3)
 STAT 5124 - Applied Statistics II (3)
 STAT 7027 - Topics in Statistics (3)
 STAT 7116 - Theory of Statistics I (3)
 STAT 7117 - Theory of Statistics II (3)

 STAT 7122 - Advanced Statistics I (3)
 STAT 7123 - Advanced Statistics II (3)
 STAT 7127 - Linear Statistical Models (3)
 STAT 7133 - Multivariate Analysis (3)
 STAT 7135 - Statistical Computation (3)
 STAT 7137 - Survival Analysis (3)
 STAT 7139 - Time Series Analysis (3)
 MATH 5128 - Applied Probability I (3)
 MATH 5129 - Applied Probability II (3)
 MATH 7120 - Probability Theory I (3)
 MATH 7121 - Probability Theory II (3)
 MATH 7125 - Stochastic Processes I (3)

Group III - Algebra-Topology

MATH 5163 - Modern Algebra (3)
 MATH 5164 - Abstract Linear Algebra (3)
 MATH 5181 - Introduction to Topology (3)
 MATH 7163 - Modern Algebra I (3)
 MATH 7164 - Modern Algebra II (3)
 MATH 7181 - Topology I (3)
 MATH 7182 - Topology II (3)

Group IV - Analysis-Dynamical Systems

MATH 5143 - Analysis I (3)
 MATH 5144 - Analysis II (3)
 MATH 7141 - Complex Analysis I (3)
 MATH 7143 - Real Analysis I (3)

MATH 7144 - Real Analysis II (3)
 MATH 7148 - Functional Analysis (3)
 MATH 7275 - Dynamical Systems I (3)
 MATH 7276 - Dynamical Systems II (3)

Group V - Mathematical Finance

MATH 6202 - Derivatives II: Partial Differential Equations for Finance (3)
 MATH 6203 - Stochastic Calculus for Finance I (3)
 MATH 6204 - Computational Methods for Asset Pricing (3)
 MATH 6205 - Financial Computing (3)
 MATH 6206 - Stochastic Calculus for Finance II (3)

Group VI - Computer Science

ITCS 5xxx - Computer Science Elective (3)
 ITCS 6xxx - Computer Science Elective (3)

Degree Total = 30 Credit Hours

Thesis

Completion of a thesis is optional. With the approval of the department Graduate Committee, a candidate may receive up to six of the 15 hours required at the 7000 level for the writing of a master's thesis on an approved topic. This thesis may be original work, work of an expository nature, or the mathematical formulation and solution of a particular industrial or business problem suggested by the career interests of the student. A candidate may receive no more than six of the hours required at the 7000 level for course and thesis work in another department. If the thesis option is selected, the candidate will be required to defend their thesis in an oral examination.

Comprehensive Examination

A candidate must perform satisfactorily on a written or oral comprehensive examination over their program of study. The thesis defense is the comprehensive examination for those students who select the thesis option.

Concentration in Applied Mathematics

The Master of Science in Mathematics with Concentration in Applied Mathematics program is designed to develop critical thinking, intuition, and advanced experience in the techniques of mathematical analysis and their application to the problems of industry and technology. Skills are developed to deal with technical problems encountered in industry, business, and government and to hold leadership positions therein; to teach Applied Mathematics at the undergraduate or community college level; and to potentially study Applied Mathematics leading to the Ph.D. degree.

Additional Admission Requirements

In addition to the general requirements for admission to the Graduate School, applicants for the Concentration in Applied Mathematics must present evidence of the satisfactory completion of at least 27 credit hours of mathematics approved by the department Graduate Committee.

Concentration Requirements

A candidate for the M.S. in Mathematics with Concentration in Applied Mathematics degree must complete at least 30 credit hours of graduate work approved by the department Graduate Committee to include:

Core Courses (21 credit hours)

MATH 5143 - Analysis I (3)
 MATH 5144 - Analysis II (3)
 MATH 5165 - Numerical Linear Algebra (3)

Numerical Analysis Courses

Select one of the following:

MATH 5172 - The Finite Element Method (3)
 MATH 5176 - Numerical Methods for Partial Differential Equations (3)

Advanced Analysis Courses

Select one of the following:

MATH 7141 - Complex Analysis I (3)
 MATH 7143 - Real Analysis I (3)
 MATH 7144 - Real Analysis II (3)
 MATH 7275 - Dynamical Systems I (3)
 MATH 7276 - Dynamical Systems II (3)

Advanced Applied Mathematics Courses

Select two of the following:

MATH 7070 - Topics in Numerical Analysis (3)
 MATH 7071 - Topics in Differential Equations (3)
 MATH 7172 - Partial Differential Equations (3)
 MATH 7176 - Advanced Numerical Analysis (3)
 MATH 7177 - Applied Optimal Control (3)
 MATH 7273 - Advanced Finite Element Analysis (3)

Elective Courses (6 credit hours)

Advanced Elective Courses

Select one of the following:

MATH 7070 - Topics in Numerical Analysis (3)
 MATH 7071 - Topics in Differential Equations (3)
 MATH 7141 - Complex Analysis I (3)
 MATH 7143 - Real Analysis I (3)
 MATH 7144 - Real Analysis II (3)
 MATH 7172 - Partial Differential Equations (3)
 MATH 7176 - Advanced Numerical Analysis (3)
 MATH 7177 - Applied Optimal Control (3)
 MATH 7273 - Advanced Finite Element Analysis (3)
 MATH 7275 - Dynamical Systems I (3)
 MATH 7276 - Dynamical Systems II (3)
 MATH 7994 - Master's Thesis Research (3)

Mathematics or Application Elective Courses

Select one Mathematics or suitable area of application course with the approval of the student's advisor.

Directed Project (3 credit hours)

All candidates for the degree concentration must complete three hours of a Directed Project in Mathematics course in which they carry out an independent project under the supervision of a member of the graduate faculty. The project could involve a specific application to a concrete problem of techniques identified in the literature or studied in other courses. All projects are subject to prior approval of the department Graduate Committee and must be successfully defended before a committee of three graduate faculty members appointed by the department Graduate Committee.

MATH 7892 - Directed Project in Mathematics (1 to 3)

Degree Total = 30 Credit Hours**Thesis**

A student may choose to expand the work begun in MATH 7892 into a master's thesis by registering for 3 credit hours of MATH 7994 to fulfill the advanced elective course requirement described above. This thesis option affords the student the opportunity to do professional/scholarly work demonstrating proficiency in the area of Applied Mathematics.

Comprehensive Examination

Each candidate for the degree concentration in Applied Mathematics must perform satisfactorily on a final comprehensive examination. This examination will be set and administered by a committee appointed by the department Graduate Committee. It may be in either written or oral form, and it will cover those areas of study and/or research deemed appropriate by the committee. The thesis defense is the comprehensive examination for those students who select the thesis option.

Concentration in Mathematics Education

The Master of Science in Mathematics with Concentration in Mathematics Education degree program is designed primarily for secondary school mathematics teachers interested in professional growth in mathematics teaching. Emphasis in this program is given to developing depth and breadth in mathematics teaching and learning, appropriate to the role of the secondary school teacher.

By the end of their first semester in the program, each student will select a member of the Mathematics Education faculty to serve as their Graduate Advisor throughout the program. Approval of the program of

each student and provision of advice regarding progress toward the degree are the responsibility of the Graduate Advisor.

Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for graduate study in Mathematics Education:

- 1) Twenty-seven hours of undergraduate coursework in Mathematics beyond the freshman level, or evidence of equivalent academic preparation.
- 2) Possession of a North Carolina "A" teacher's license or the equivalent from another state is preferred.
- 3) Two years of full-time experience teaching mathematics in a secondary school or other acceptable teaching experience.

Concentration Requirements

Candidates for the M.S. in Mathematics with Concentration in Mathematics Education degree must complete a minimum of 33 credit hours of graduate coursework or the equivalent. Of these, 18 credit hours must be in courses numbered 6000 or above. Programs of study beyond these 33 credit hours may be required to remove deficiencies in undergraduate programs or to develop areas of need, interest, or desired experience.

Core Courses (15 credit hours)

MATH 5109 - History of Mathematical Thought (3)
 MATH 6101 - Foundations of Mathematics (3)
 MATH 6102 - Real Analysis for Mathematics Teachers (3)
 MATH 6108 - Probability and Statistics for Mathematics Teachers (3)
 or STAT 6108 - Probability and Statistics for Mathematics Teachers (3)
 MATH 6118 - Non-Euclidean Geometry (3)

Mathematical Foundations and Algebra Courses (6 credit hours)

Select two of the following:

MATH 5161 - Number Theory (3)
 MATH 6106 - Modern Algebra for Mathematics Teachers (3)
 MATH 6107 - Linear Algebra for Mathematics Teachers (3)

Mathematics Education Courses (9 credit hours)

Students take graduate-level courses covering mathematics education learning theory, research, and contemporary topics in secondary mathematics teaching.

MAED 6122 - Theoretical Foundations of Learning Mathematics (3)
 MAED 6123 - Research in Mathematics Education (3)
 MAED 6124 - Issues in the Teaching of Mathematics (3)

Professional Education Course (3 credit hours)

MDSK 6260 - Teacher Leadership (3)

Degree Total = 33 Credit Hours

Basic Portfolio

Each student must complete a Basic Portfolio consisting of documents and artifacts that provides evidence of the student's professional growth during the program.

Substitutions to satisfy any of the Concentration Requirements must be approved by the Graduate Advisor and the Mathematics Education Coordinator.

Comprehensive Examination

Upon successful completion of all coursework, each candidate for the M.S. in Mathematics with Concentration in Mathematics Education degree is required to demonstrate that they have met the program goals in an oral presentation consisting of two parts. In the first part, the student answers questions from the faculty that focus on the mathematics content courses. The second part of the exam involves the student presenting documentation that demonstrates their professional growth as teachers and educational researchers. The student has the option of presenting either a research-based project or a comprehensive portfolio. The Graduate Advisor advises and assists the student in planning their Comprehensive Portfolio or Final Research Report.

Concentration in Actuarial Statistics

The Master of Science in Mathematics with Concentration in Actuarial Statistics provides advanced skills and knowledge to individuals seeking actuarial careers in insurance and financial institutions. In addition to acquiring statistical and computational skills, the required courses for this concentration are designed to prepare students to pass a series of examinations needed to earn an Actuarial Designation with the Society of Actuaries or the Casualty Actuarial Society.

Additional Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for the Concentration in Actuarial Statistics:

- 9 credit hours of calculus at the level of MATH 1241, MATH 1242, and MATH 2241
- 3 credit hours of linear algebra at the level of MATH 2164
- Applicants must present evidence of undergraduate preparation in basic actuarial science including:
 - 6 credit hours of probability courses at the level of MATH 3122 or STAT 3122 and MATH 3123 or STAT 3123 with a grade of B or above, or passing the SOA Exam P
 - 6 credit hours of financial mathematics courses at the level of MATH 2228 and MATH 3228 with a

grade of B or above, or passing the SOA Exam FM

- 6 credit hours of statistics courses at the level of STAT 3110 and STAT 3150 with a grade of B or above

Concentration Requirements

Core Courses (18 credit hours)

The following required courses prepare students for Actuarial Exams FAM (Fundamentals in Actuarial Mathematics), ALTAM (Advanced Long-Term Actuarial), and SRM (Statistics for Risk Modeling). Note that Actuarial Exam P (Probability) and FM (Financial Mathematics) are taught at the undergraduate level.

MATH 5228 - Life Insurance Mathematics (3)
 MATH 5229 - Advanced Life Insurance Mathematics (3)
 STAT 5123 - Applied Statistics I (3)
 STAT 5227 - Loss Models and Applications (3)
 STAT 6113 - Cross-Section and Time-Series Econometrics (3)
 STAT 6115 - Statistical Learning with Big Data (3)

Elective Courses (12 credit hours)

Select from the following with at least 3 credit hours in MATH or STAT courses:

DSBA 6112 - Graduate Econometrics (3)
 DSBA 6201 - Business Intelligence and Analytics (3)
 DSBA 6211 - Advanced Business Analytics (3)
 MATH 6203 - Stochastic Calculus for Finance I (3)
 STAT 5124 - Applied Statistics II (3)
 STAT 7122 - Advanced Statistics (3)
 STAT 7133 - Multivariate Analysis (3)
 STAT 7135 - Statistical Computation (3)
 STAT 7137 - Survival Analysis (3)
 FINN 6152 - Financial Management (3)
 FINN 6153 - Investment Management (3)
 FINN 6203 - Financial Economic Theory (3)
 FINN 6214 - Asset and Portfolio Management (3)
 ITCS 5156 - Applied Machine Learning (3)
 ITCS 6114 - Algorithms and Data Structures (3)

Note: Other courses may be considered with permission of the department. The following courses cover topics for Exam SRM:

STAT 5124 - Applied Statistics II (3)
 STAT 6113 - Cross-Section and Time-Series Econometrics (3)
 STAT 6115 - Statistical Learning with Big Data (3)
 STAT 7133 - Multivariate Analysis (3)
 STAT 7137 - Survival Analysis (3)
 ITCS 5156 - Applied Machine Learning
 ITCS 6114 - Algorithms and Data Structures

Capstone Requirement

Students in the M.S. in Mathematics with Concentration in Actuarial Statistics may select one of the following options as their Capstone Requirement:

Directed Project

Students who select this option complete 3 credit hours of MATH 7892 or STAT 7892 in which they carry out an independent project under the supervision of a member of the graduate faculty. If the project option is selected, the candidate is required to defend their project before a committee of three graduate faculty members appointed by the department Graduate Committee.

Comprehensive Examination

Each candidate for the Concentration in Actuarial Statistics must perform satisfactorily on a final comprehensive examination. This examination is set and administered by a committee appointed by the department Graduate Committee. It may be in either written or oral form, and it covers those areas of study on the Long-Term and Short-Term Actuarial Mathematics, including MATH 5228 and STAT 5227. The research seminar project defense is the comprehensive examination for those students who select the research seminar option.

Degree Total = 30 Credit Hours

Concentration in Applied Statistics

The Master of Science in Mathematics with Concentration in Applied Statistics program is designed to provide advanced skills and knowledge in the planning, design, testing, and implementation of statistical methods. Skills are developed to deal with problems encountered in statistical applications in business, industry, and government; to hold administrative positions requiring planning and implementation of statistical analysis; to teach statistics at the undergraduate or community college level; and to potentially study statistics leading to the Ph.D. degree.

Additional Admission Requirements

In addition to the general requirements for admission to the Graduate School, the following are required for the concentration in Applied Statistics:

- 1) An overall GPA of at least 3.0 on all previous college work including a GPA of at least 3.0 in courses prerequisite to the area of statistics.
- 2) Evidence of undergraduate preparation in mathematics and statistics including: 12 credit hours of calculus at the level of MATH 1241, MATH 1242, MATH 2241, and MATH 2242; 3 credit hours of linear algebra at the level of MATH 2164; and 6 credit hours of probability and statistics at the level of MATH/STAT 3122 and MATH/STAT 3123.

Concentration Requirements

A candidate for the M.S. in Mathematics with Concentration in Applied Statistics degree must complete a minimum of 33 credit hours of graduate work approved by the department Graduate Committee, including:

Core Courses (21 credit hours)

STAT 5123 - Applied Statistics I (3)
 STAT 5124 - Applied Statistics II (3)
 STAT 7027 - Topics in Statistics (3)
 STAT 7116 - Theory of Statistics I (3)
 STAT 7117 - Theory of Statistics II (3)
 STAT 7127 - Linear Statistical Models (3)
 STAT 7133 - Multivariate Analysis (3)

Note: Students who, because of their undergraduate work or other experience, can demonstrate sufficient knowledge of the material in one or more of the core courses may be exempted from taking a course or courses. Exemption from a course carries no credit towards the degree concentration.

Elective Courses (9 credit hours)

MATH/STAT or Applied Elective Courses

Select two courses from an approved list. Examples include:

MATH 5128 - Applied Probability I (3)
 MATH 5129 - Applied Probability II (3)
 MATH 5143 - Analysis I (3)
 MATH 5165 - Numerical Linear Algebra (3)
 MATH 7120 - Probability Theory I (3)
 MATH 7121 - Probability Theory II (3)
 MATH 7143 - Real Analysis I (3)
 STAT 6115 - Statistical Learning with Big Data (3)
 STAT 7027 - Topics in Statistics (3)
 STAT 7135 - Statistical Computation (3)
 STAT 7137 - Survival Analysis (3)
 STAT 7139 - Time Series Analysis (3)
 STAT 7891 - Independent Study in Statistics (1 to 3)

MATH or STAT Elective Course

Select one of the following:

MATH 7xxx - Mathematics Elective (3)
 STAT 7xxx - Statistics Elective (3)

Degree Total = 33 Credit Hours

Capstone Requirement

Students in the M.S. in Mathematics with Concentration in Applied Statistics may select a directed project or a thesis as their Capstone Requirement.

Directed Project (3 credit hours)

Students who select this option complete 3 credit hours of STAT 7892 in which they carry out a one-semester independent project under the supervision of a member of the graduate faculty. The project could involve a specific

application of techniques identified in the literature or studied in other courses. The project must be successfully defended before a committee of three graduate faculty members, appointed by the Department's Graduate Committee, and a final project report must be submitted to the Department.

Thesis (6 credit hours)

Students who select this option complete a two-semester thesis project under the supervision of a member of the graduate faculty, registering for 3 credit hours of STAT 7892 in the first semester and then 3 credit hours of MATH 7994 in the second. The thesis must adhere to the Graduate School's guidelines. The 3 credit hours of MATH 7994 may count toward the MATH/STAT 7000-level elective course requirement above. This thesis option provides students with the opportunity to engage in professional and scholarly work, demonstrating proficiency in applied statistics.

MATH 7994 - Master's Thesis Research (3)

STAT 7892 - Directed Project in Statistics (1 to 3)

NANOSCALE SCIENCE

• Ph.D. in Chemistry and Nanoscale Science

Graduate Program

nanoscalescience.charlotte.edu

Ph.D. in Chemistry and Nanoscale Science

The Ph.D. in Chemistry and Nanoscale Science is an interdisciplinary program that addresses the development, manipulation, and use of materials and devices on the scale of roughly 1-100 nanometers in length (larger for bio nanomaterials), and the study of phenomena that occur on this size scale. The program prepares students to become scholarly, practicing scientists who possess the technical, critical thinking, and communication skills needed to advance and disseminate knowledge of fundamental and applied nanoscale science.

The many challenges and opportunities nanoscale science presents to society require collaborative, interdisciplinary approaches to research. Students enrolled in UNC Charlotte's Chemistry and Nanoscale Science Ph.D. program learn about the exciting field of nanoscale science from the perspectives of faculty members trained in numerous types of disciplines, and they learn how to work effectively with scientists and engineers, from various fields, on cutting-edge research projects.

Students in the program acquire the knowledge, skills, and credentials needed to compete effectively for many types of positions by completing interdisciplinary nanoscale science courses and elective courses, participating in program colloquia and seminars, and by making research contributions independently and as part of a team. Graduates of our program are gainfully employed in academic, industrial, and government positions.

Admission Requirements

The following are general guidelines for successful admission into the Ph.D. program in Chemistry and Nanoscale Science:

- 1.) A bachelor's or master's degree in a science or engineering discipline relevant to nanoscale science is required for admission to full standing in the Nanoscale Science Ph.D. program.
- 2.) A minimum undergraduate GPA of 3.0 or, if the applicant is currently enrolled in a graduate program

or has earned a master's degree, a minimum grade point average of 3.0 in a relevant science or engineering master's program.

- 3.) Three strong, positive letters of recommendation, at least two of which should come from faculty in the applicant's current or previous academic program. All letters should be written by individuals in a position capable of judging the applicant's likely success in a Ph.D. level program. Letters should address the applicant's suitability for a Ph.D. program and ability to complete the program in a timely manner.
- 4.) Admission of students who are not native English speakers will require strong scores on the TOEFL exam. The TOEFL exam is a required part of the application for non-native English speakers.

Documents To Be Submitted For Application For Admission

- 1.) Official transcripts from all colleges and universities attended (indicating completion of a bachelor's degree in a relevant science or engineering discipline)
- 2.) The UNC Charlotte application for graduate admission form
- 3.) Three letters of reference from academics who have taught or worked directly with the applicant
- 4.) An essay that addresses professional goals and motivation for pursuing the degree, suitability for the program, and career goals following the program
- 5.) TOEFL scores (if the applicant is not a native English speaker)

Note: Standardized test scores (e.g., GRE, MAT) are not required.

Admissions Assessment

An admissions committee will review applications and recommend to the Program Director whether each applicant should be admitted and, if so, under what conditions.

Degree Requirements

The Ph.D. in Chemistry and Nanoscale Science requires 72 credit hours. Core courses account for at least 27 credit hours, elective courses account for at least 6 credit hours, and dissertation research accounts for at least 18 credit hours. The remaining credit hours are fulfilled by enrolling in a combination of restricted elective courses. Students may count other courses towards meeting the 72 credit hour requirement with approval of the Graduate Program Director.

General Science Proficiency Exam (GSPE)

The purpose of the GSPE is to ensure that students possess a working knowledge of material needed to master concepts in nanoscale science. The exam covers introductory material in chemistry, physics, and mathematics (including calculus). The exam is administered

three times per year - in August (during Orientation Week), January, and May. After taking the GSPE, students meet with the GSPE Administrator to discuss exam results and how to address any deficiencies. Students who do not pass the GSPE by the end of their first year of enrollment will be terminated from the program.

Core Courses (27 credit hours)

NANO 8001 - Perspectives at the Nanoscale (2)
 NANO 8101 - Introduction to Instrumentation and Processing at the Nanoscale (3)
 NANO 8102 - Nanoscale Phenomena (3)
 NANO 8103 - Synthesis and Characterization of Nanomaterials (3)
 NANO 8105 - Life at the Nanoscale (3)
 NANO 8203 - Collaborative Research Proposal (3)
 NANO 8301 - Nanomedicine (3)
 or NANO 8351 - Nanoscale Materials for Energy Applications (3)
 NANO 8681 - Nanoscale Science Seminar (1) *
 NANO 8682 - Nanoscale Science Colloquium (1) **

** Students must enroll in NANO 8681 during every semester in residence, except when enrolled in GRAD 9800 or GRAD 9999, for a minimum of four semesters.*

*** Students must enroll in NANO 8682 during the three semesters immediately following enrollment in NANO 8001.*

Elective Courses (6 credit hours)

In addition to completing the Core Courses, students must complete a minimum of 6 credit hours of Elective Courses. Elective Courses are selected in consultation with the student's advisor (normally the dissertation advisor) to best meet the student's needs and interests. Any of the following courses may be used to meet elective requirements:

BIOL 7000-8999 - Biological Sciences Elective
 CHEM 7000-8999 - Chemistry Elective
 ECGR 7000-8999 - Electrical and Computer Engineering Elective
 MEGR 7000-8999 - Mechanical Engineering Elective
 OPTI 7000-8999 - Optical Science Elective
 PHYS 7000-8999 - Physics Elective

Other courses may be used to satisfy elective requirements, provided that prior approval has been obtained from the Graduate Program Director. Students may count one 5000 level course towards meeting elective requirements if approved in advance by the Graduate Program Director.

Dissertation Research (18 credit hours)

Students must complete a minimum of 18 credit hours of the following:

NANO 8900 - Dissertation Research (1 to 4)

Additional Coursework (21 credit hours)

The remaining 21 credit hours are fulfilled by enrolling in any combination of the following courses. Students may count other courses towards meeting the 72 credit hour requirement with approval of the Graduate Program Director.

NANO 8400 - Nanoscale Science Internship (1 to 9)

NANO 8681 - Nanoscale Science Seminar (1)

NANO 8900 - Dissertation Research (1 to 4)

NANO 8000-8999 - Nanoscale Science Elective

BIOL 7000-8999 - Biological Sciences Elective

CHEM 6150 - Seminar-Internship (1 to 3)

CHEM 7000-8999 - Chemistry Elective

ECGR 7000-8999 - Electrical and Computer Engineering Elective

MEGR 7000-8999 - Mechanical Engineering Elective

OPTI 7000-8999 - Optical Science Elective

PHYS 7000-8999 - Physics Elective

Degree Total = 72 Credit Hours

Grade Requirements

Graduate students must have a GPA of 3.2 or higher to graduate from the program. Two grades of C or one grade of U will result in termination from the program.

Admission to Candidacy Requirements

The Graduate School requires doctoral students to pass a qualifying examination, and to advance to candidacy by successfully defending a dissertation topic proposal at a meeting of the student's advisory/dissertation committee. Because of its emphasis on proposal writing and development, the Chemistry and Nanoscale Science Ph.D. program links the qualifying examination with the dissertation topic proposal defense.

Before the third semester in residence, each student (in consultation with their research advisor) chooses a preliminary dissertation committee that should normally include four faculty members (counting the student's dissertation advisor) who the student expects will provide valuable scientific input based on their areas of expertise (Note: The Graduate Faculty Representative is not appointed at this stage, hence this is a preliminary dissertation committee). Members of the preliminary dissertation committee must have Graduate Faculty status and be affiliated with the Chemistry and Nanoscale Science Ph.D. program.

Students are encouraged to begin the qualifying exam / dissertation topic proposal process towards the end of their fourth semester in residence. The process begins when the student submits a written proposal for

dissertation research that is distributed to the preliminary dissertation committee. Within two weeks after the proposal is submitted, the preliminary dissertation committee develops a written qualifying exam that is administered to the student. The exam questions should be related to the student's proposal, and they may also be related to the student's coursework as it applies to areas associated with the proposed dissertation project or the student's research group. The student is given one week to complete the exam.

Once the student has passed the exam, an oral defense of the dissertation topic proposal is conducted in a meeting with the student's full dissertation committee (including the Graduate School Representative). A student who does not pass the qualifying exam may take it one more time. Likewise, a student who does not pass the dissertation topic proposal defense may have a second chance to succeed.

Students are encouraged to complete the qualifying exam and dissertation topic proposal defense before the fifth semester in residence. Under normal circumstances, they must complete both requirements before the beginning of the sixth semester in residence.

Advising/Committees

The Graduate Program Director serves as the student's academic advisor until a research advisor is chosen (normally before the beginning of the second semester in residence). Once selected, the research advisor will serve as the student's academic advisor. The Graduate Program Director is responsible for monitoring student progress. Students must obtain the Graduate Program Director's permission to enroll in any courses. Students are encouraged to form a dissertation committee (minus the Graduate School representative), as soon as possible after selecting a research advisor, and to consult regularly with the committee members on research and academic progress. The aforementioned committee will administer the Qualifying Exam to the student. Once the student passes the Qualifying Exam, the Graduate School Representative will be appointed to complete the dissertation committee.

Application for Degree

Each student should make application for their degree by completing the online Application for Degree through Banner Self Service no later than the filing date specified in the University Academic Calendar. After successful defense of the dissertation, a student will be conferred with the doctoral degree.

Residency Requirement

Students must satisfy the residency requirement for the program by completing 21 credit hours of continuous

enrollment, such as coursework or dissertation credits. Residence is considered continuous if the student is enrolled in one or more courses in successive semesters until 21 credit hours are earned.

Time Limits for Completion

The student must achieve admission to candidacy within six years after admission to the program. All requirements for the degree must be completed within nine years after initial registration as a doctoral student. These time limits are considered to be maxima; full-time students are typically expected to complete their degree requirements within 4-5 years of initial registration as a Chemistry and Nanoscale Science Ph.D. student.

Transfer Credit

Students who have completed graduate coursework but have not earned a graduate degree may transfer up to 6 credit hours of coursework. Students who have earned a Master's degree may transfer up to 30 credit hours of coursework. Students who wish use transfer coursework credits towards meeting degree requirements for the Chemistry and Nanoscale Science Ph.D. should consult with the Graduate Program Director as soon as possible.

OPTICAL SCIENCE AND ENGINEERING

- Ph.D. in Optical Science and Engineering
- M.S. in Optical Science and Engineering

Graduate Program

optics.charlotte.edu

The M.S. and Ph.D. programs in Optical Science and Engineering are interdisciplinary, involving primarily five science and engineering departments (Departments of Physics & Optical Science, Chemistry, Mathematics & Statistics, Electrical & Computer Engineering, and Mechanical Engineering & Engineering Science) and four centers (Center for Optoelectronics & Optical Communications, Center for Metamaterials, Center for Freeform Optics, and Center for Precision Metrology). The program is administered through the Department of Physics and Optical Science. The purpose of the program is to educate scientists and engineers who will develop the next generation of optical technology. The program emphasizes basic and applied interdisciplinary education and research in the following specialties of optics:

- Micro-optics and nanophotonics
- Fiber and integrated optics
- Optoelectronic materials and devices
- Biomedical optics
- Optical interferometry and metrology
- Optical fabrication
- Nanoscale imaging and spectroscopy
- Adaptive optics
- Optical communication
- Novel light-matter interactions
- Quantum optics
- Optical sensors and measurements

A complete description of the research activity within the Optical Science and Engineering program can be accessed online at optics.charlotte.edu.

Ph.D. in Optical Science and Engineering

Admission Requirements

All applicants seeking admission into the Optical Science and Engineering Ph.D. program must fulfill the university's general requirements for graduate admission at the Ph.D.

level. Additional requirements for admission into the program are:

- A baccalaureate or master's degree in Physics, Chemistry, Mathematics, Engineering, Optics, or a related field
- Minimum undergraduate GPA of 3.0 overall and 3.2 (on a scale of 4.0) in the major (if a candidate presents a master's degree at application, a minimum graduate GPA of 3.2 on all graduate work is required)
- A minimum combined score of 301 on the verbal and quantitative portions of the GRE General Test (no subject test is required)
- Positive letters of recommendation
- Students may be required to take undergraduate courses determined by the Interdisciplinary Optics Program Committee on an individual basis; such courses will be specified at the time of admission into the program

GRE Waiver

The GRE General Test requirement is waived for applicants who have graduated from UNC Charlotte within the past three years and earned a minimum 3.4 GPA in the major. The GRE General Test is also waived for applicants who are currently enrolled in the M.S. in Optical Science and Engineering or M.S. in Applied Physics at UNC Charlotte.

Documents to Submit for Admission

- UNC Charlotte online application for graduate admission
- Official GRE scores
- Official TOEFL or IELTS score from international applicants whose native language is not English, unless the previous degree was from a country where English is the official language
- Unofficial transcripts from all colleges and universities attended should be uploaded to the application (Applicants offered admission will be required to submit official transcripts)
- A minimum of three letters of reference
- A Statement of Purpose essay detailing the applicant's motivation and career goals

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Degree Requirements

The Ph.D. in Optical Science and Engineering is awarded for completion of scholarly research that advances the knowledge base in the field and is demonstrated by a successful dissertation defense. Additionally, recipients of this degree should demonstrate mastery of relevant subject matter and a potential for success in future research and teaching.

The minimum requirement for the Ph.D. degree in Optical Science and Engineering is 72 credit hours beyond the baccalaureate degree.

Each candidate for the Ph.D. degree in Optical Science and Engineering must complete the following:

- Present evidence of competency in the core curriculum by successfully completing 18 of 21 credit hours of core courses with a grade of B or above in each course
- A minimum of 9 credit hours of elective OPTI courses in addition to the core curriculum
- 1 credit hour of OPTI 8610 (Seminar) during the Fall semester of the first academic year in the program
- 1 credit hour of OPTI 8611 (Graduate Colloquium) during the Spring semester for the first academic year in the program and 1 credit hour of OPTI 8611 each subsequent academic year in the program
- A minimum of 24 credit hours of OPTI 8991 (Dissertation Research)
- The remaining credit hours may be dissertation research credits, elective courses, or a combination
- Successfully complete the written and oral qualifying exam
- Select a dissertation advisor and form an advisory committee
- Prepare a plan of study detailing how you intend to satisfy the 72 credit hour requirement
- Successfully submit a Ph.D. research proposal
- Successfully defend the Ph.D. dissertation

Core Curriculum (18 credit hours)

All graduates of the program must demonstrate competency in the core curriculum. Students may do so by completing 18 of the 21 available credit hours of core courses with a grade of B or above in each course. The course makeup of the 18 credit hours, changing the course makeup, or withdrawing from a core course must be approved by the academic advisor or program director. Competency is typically demonstrated by the end of the 3rd semester in the program. With program director approval, students may demonstrate competency by passing a core competency exam. Credit hours that would have been earned if the student had taken the course may be replaced by dissertation research or an approved elective.

Select from the following:

- OPTI 8101 - Mathematical Methods of Optical Science and Engineering (3)
- OPTI 8102 - Principles of Geometrical Optics (3)
- OPTI 8102L - Geometrical Optics Lab (1)
- OPTI 8103 - Light Sources and Detectors (3)
- OPTI 8104 - Electromagnetic Waves (3)
- OPTI 8105 - Optical Properties of Materials (3)
- OPTI 8106 - Principles of Physical Optics (3)
- OPTI 8106L - Physical Optics Lab (2)

OPTI Elective Courses (9 credit hours)

Select OPTI courses in addition to the OPTI courses in the Core Curriculum.

Seminar Course (1 credit hour)

To be taken during the Spring semester of the first academic year in the program:

- OPTI 8610 - Seminar (1)

Colloquium Courses

To be taken each subsequent academic semester in the program, following the Seminar Course:

- OPTI 8611 - Graduate Colloquium (1)

Dissertation Research Course (24 credit hours)

Complete a minimum of 24 credit hours of dissertation research.

- OPTI 8991 - Dissertation Research (1 to 3)

Elective Courses

The remaining credit hours of the program may be dissertation research credits, elective courses, or a combination. Elective courses must be approved by the academic advisor and may include courses having a prefix of OPTI, PHYS, ECGR, MEGR, and NANO. Other courses may be considered as well. Ph.D. students should enroll in 8000-level courses when possible.

Molecular Biophysics Concentration - Optional (8 credit hours)

- PHYS 6108 - Biophysics (3)
- PHYS 6204 - Methods of Molecular Modeling and Simulation in Physics (3)
- PHYS 6610 - Biophysics Seminar (1) *(to be taken twice)*

Degree Total = 72 Credit Hours

Grade Requirements

Students in the Ph.D. program must maintain a minimum cumulative GPA of 3.0 in all coursework attempted for the degree. An accumulation of two C grades will result in suspension from the program. A grade of U earned in

any course will result in suspension from the program. An accumulation of three C grades or two U grades will result in closure of the student's enrollment in the program..

Application for Degree

Students should submit an Application for Degree at the beginning of the term in which they anticipate defending their dissertation. Adherence to Graduate School deadlines is expected. Degree requirements are completed when students successfully defend their dissertation and file the final copy of the dissertation in the Graduate School.

Assistantships

Support for beginning graduate students is usually a teaching assistantship. Continuing students are usually supported by research assistantships.

Dissertation

Each student will complete a minimum of 24 credit hours of dissertation research. The student must submit a written dissertation for final review to the advisory committee three weeks before the defense date. The student must defend the dissertation before the advisory committee at a presentation which is open to the University community. Upon approval of the written dissertation and oral presentation by the advisory committee, the student has successfully completed the dissertation requirement. The dissertation must be written using a format acceptable to the Graduate School.

Dissertation Advisor and Advisory Committee

Each student in the program must have a dissertation advisor and an advisory committee. The program director serves as academic advisor until the student selects a dissertation advisor. The student selects the dissertation advisor by submitting a Dissertation Advisor Form. The student should select the advisor before the end of the second year of residency. The student and advisor determine the committee by agreement. The advisor serves as chair of the committee and must be a member of the Optics Faculty and a regular member of the Graduate Faculty at UNC Charlotte. The Dean of the Graduate School appoints a committee member to serve as the Graduate Faculty Representative. The committee must have at least 4 members, one of whom is the chair and one of whom is the Graduate Faculty Representative. All members of the committee must be members of the Graduate Faculty and a majority must be members of the Optics Faculty. Composition of the advisory committee must be approved by the Optics Program Director and the Dean of the Graduate School.

Qualifying Exam

Students participate in a written and oral qualifying

examination administered by the optics faculty during the third semester of enrollment in the program. If a student fails the qualifying examination, it may be retaken once. If a student fails the exam a second time, the student's enrollment in the Ph.D. program will be closed.

Plan of Study

All students should prepare a plan of study before the end of their fourth semester following admission to the program. The plan of study shows in detail how the student intends to meet the degree requirements. The plan of study must be approved by the advisory committee and the optics program director.

Research Proposal

After successful demonstration of competency in the core curriculum and approval of the plan of study, the student will prepare a written research proposal and present an oral defense of the proposal to their advisory committee. This should be completed within three years following admission to the program. The research proposal, also called the dissertation topic proposal, must be approved by the advisory committee. The research proposal demonstrates the student's knowledge of the relevant literature and the specific research problems and methods of study that, if successfully completed, will lead to an acceptable dissertation.

Residency Requirement

The student must satisfy the residence requirement for the program by completing 20 credit hours of continuous enrollment in coursework/dissertation credit. Residence is considered continuous if the student is enrolled in one or more courses in successive semesters until 20 credit hours are earned.

Responsible Conduct of Research

UNC Charlotte is committed to ensuring that doctoral students understand their obligations as researchers. All first year doctoral students in science, math, engineering, or technology are required to enroll in GRAD 8302 (Responsible Conduct of Research). This two credit hour course prepares students for a range of research related issues.

Transfer Credit

Up to 30 credit hours of approved coursework may be transferred from a master's and/or doctoral program from a college or university accredited by an accepted accrediting body. Only courses in which the student earned a grade of B or above (or its equivalent) can be transferred. No more than 6 credit hours of approved coursework taken as a post-baccalaureate student may be applied toward the degree. Credit for dissertation research cannot be transferred.

M.S. in Optical Science and Engineering

Admission Requirements

All applicants seeking admission into the M.S. in Optical Science and Engineering program must fulfill the University's general requirements for graduate admission at the Master's level. Additional requirements for admission into the program are:

- A baccalaureate or master's degree in Physics, Chemistry, Mathematics, Engineering, Optics, or a related field
- Minimum undergraduate GPA of 3.0 overall and 3.0 (on a scale of 4.0) in the major
- A minimum combined score of 293 on the verbal and quantitative portions of the GRE revised General Test
- Positive letters of recommendation
- Students may be required to take undergraduate courses determined by the Interdisciplinary Optics Program Committee on an individual basis; such courses will be specified at the time of admission into the program

Documents to Submit for Admission

- UNC Charlotte online application for graduate admission
- Official GRE scores
- Official TOEFL or IELTS score from international applicants whose native language is not English, unless the previous degree was from a country where English is the official language
- Unofficial transcripts from all colleges and universities attended should be uploaded to the application (Applicants offered admission will be required to submit official transcripts)
- A minimum of three letters of reference
- A Statement of Purpose essay detailing the applicant's motivation and career goals

GRE Waiver

The GRE General Test requirement is waived for applicants who have graduated from UNC Charlotte within the past three years and earned a minimum 3.4 GPA in the major.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the

Graduate Catalog for more information about Early Entry Programs.

Degree Requirements (Non-Thesis Option)

The Master of Science degree with non-thesis option in Optical Science and Engineering is awarded for completion of formal coursework, demonstration of competency in the core curriculum, and successful completion of the written and oral comprehensive examination.

The program director serves as academic advisor for each student in a program of study with the non-thesis option. The minimum requirement for the M.S. degree with non-thesis option is 32 credit hours beyond the baccalaureate degree. Each candidate for the M.S. degree with non-thesis option must complete the following and prepare a plan of study detailing how they intend to satisfy the 32 credit hour requirement.

Core Curriculum (15 credit hours)

All graduates of the program must demonstrate competency in the core curriculum. Students may do so by completing 15 of the 21 available credit hours of core courses with a grade of B or above in each course. The course makeup of the 15 credit hours, changing the course makeup, or withdrawing from a core course must be approved by the academic advisor or program director. Competency is typically demonstrated by the end of the 3rd semester in the program. With program director approval, students may demonstrate competency by passing a core competency exam. Credit hours that would have been earned if the student had taken the course may be replaced by approved credit hours.

Select from the following:

- OPTI 6101 - Mathematical Methods of Optical Science and Engineering (3)
- OPTI 6102 - Principles of Geometrical Optics (3)
- OPTI 6102L - Geometrical Optics Lab (1)
- OPTI 6103 - Light Sources and Detectors (3)
- OPTI 6104 - Electromagnetic Waves (3)
- OPTI 6105 - Optical Properties of Materials (3)
- OPTI 6106 - Principles of Physical Optics (3)
- OPTI 6106L - Physical Optics Lab (2)

Plan of Study

After successful demonstration of competency in the core curriculum, students should prepare a plan of study which shows in detail how the student will meet the degree requirements. The plan of study must be approved by the optics program director.

Elective Courses (15 credit hours)

Elective courses must be approved by the academic advisor and may include courses having a prefix of OPTI, PHYS, ECGR, MEGR, and NANO. Other courses may be

considered as well. M.S. students should enroll in 6000-level courses when possible.

Seminar Course (1 credit hour)

To be taken during the Fall semester of the first academic year in the program:

OPTI 6610 - Seminar (1)

Colloquium Course (1 credit hour)

To be taken during the Spring semester of the first academic year in the program:

OPTI 6611 - Graduate Colloquium (1)

Comprehensive Examination

Each student in a program of study with the non-thesis option will participate in the written and oral comprehensive examination administered by the optics faculty no later than the semester following the successful demonstration of competency in the core curriculum.

Degree Total = 32 Credit Hours

Degree Requirements (Thesis Option)

The Master of Science degree in Optical Science and Engineering with thesis option is awarded for completion of scholarly research that advances the knowledge base in the field and is demonstrated by a successful thesis defense.

The minimum requirement for the M.S. degree with thesis option is 32 credit hours beyond the baccalaureate degree. Each candidate for the M.S. degree with non-thesis option must complete the following and prepare a plan of study detailing how they intend to satisfy the 32 credit hour requirement.

Additionally, for the thesis option, students must:

- Select a thesis advisor and form an advisory committee
- Successfully submit an M.S. research proposal
- Successfully defend the M.S. thesis

Core Curriculum (15 credit hours)

All graduates of the program must demonstrate competency in the core curriculum. Students may do so by completing 15 of the 21 available credit hours of core courses with a grade of B or above in each course. The course makeup of the 15 credit hours, changing the course makeup, or withdrawing from a core course must be approved by the academic advisor or program director. Competency is typically demonstrated by the end of the 3rd semester in the program. With program director approval, students may demonstrate competency by passing a core competency exam. Credit hours that

would have been earned if the student had taken the course may be replaced by approved credit hours.

Select from the following:

OPTI 6101 - Mathematical Methods of Optical Science and Engineering (3)
 OPTI 6102 - Principles of Geometrical Optics (3)
 OPTI 6102L - Geometrical Optics Lab (1)
 OPTI 6103 - Light Sources and Detectors (3)
 OPTI 6104 - Electromagnetic Waves (3)
 OPTI 6105 - Optical Properties of Materials (3)
 OPTI 6106 - Principles of Physical Optics (3)
 OPTI 6106L - Physical Optics Lab (2)

Plan of Study

After successful demonstration of competency in the core curriculum, students should prepare a plan of study which shows in detail how the student will meet the degree requirements. The plan of study must be approved by the optics program director.

Elective Courses (6 credit hours)

Elective courses must be approved by the academic advisor and may include courses having a prefix of OPTI, PHYS, ECGR, MEGR, and NANO. Other courses may be considered as well. M.S. students should enroll in 6000-level courses when possible.

Seminar Course (1 credit hour)

To be taken during the Fall semester of the first academic year in the program:

OPTI 6610 - Seminar (1)

Colloquium Course (1 credit hour)

To be taken during the Spring semester of the first academic year in the program:

OPTI 6611 - Graduate Colloquium (1)

Thesis Requirements

Thesis Advisor and Advisory Committee

Each student in a program of study with the thesis option must have a thesis advisor and an advisory committee. The program director serves as the academic advisor for each student in a program of study with the thesis option until the student selects a thesis advisor. The student selects the thesis advisor by submitting a Thesis Advisor Form. The student should select the advisor before the end of the first year of residency. The student and advisor determine the advisory committee by agreement. The advisor serves as chair of the advisory committee and must be a member of the Optics Faculty and a regular member of the Graduate Faculty at UNC Charlotte. The advisory committee must have at least 3 members, one of whom is the chair. All members of the committee must be members of the Graduate Faculty, and a majority must

be members of the Optics Faculty. Composition of the advisory committee must be approved by the optics program director.

Thesis Research Proposal

After successful demonstration of competency in the core curriculum, a student in a program of study that includes the thesis option will prepare a written research proposal. This should be completed within two years following admission to the program. The research proposal, also called the thesis topic proposal, must be approved by the advisory committee. The research proposal demonstrates the student's knowledge of the relevant literature and the specific research problems and methods of study that, if successfully completed, will lead to an acceptable thesis.

Thesis Research (9 credit hours)

Each student in a program of study that includes a thesis option will complete a minimum of 9 credit hours of thesis research. The student must submit a written thesis for final review to the advisory committee three weeks before the defense date. The student must defend the thesis before the advisory committee at a presentation which is open to the University community. Upon approval of the written thesis and oral presentation by the advisory committee, the student has successfully completed the thesis requirement. The thesis must be written using a format acceptable to the Graduate School.

OPTI 6991 - Thesis Research (1 to 3)

Degree Total = 32 Credit Hours

Grade Requirements

Students in the M.S. program must maintain a minimum cumulative GPA of 3.0 in all coursework attempted for the degree. An accumulation of two C grades will result in suspension from the program. A grade of U earned in any course will result in suspension from the program. An accumulation of three C grades or two U grades will result in termination from the program.

Application for Degree

Students should submit an Application for Degree at the beginning of the term in which they anticipate graduating. Adherence to Graduate School deadlines is expected.

Assistantships

Support for beginning graduate students is usually a teaching assistantship. Continuing students are often supported by research assistantships.

Residency Requirement

The student must satisfy the residence requirement for the program by completing 12 credit hours of continuous enrollment in coursework/thesis credit. Residence is

considered continuous if the student is enrolled in one or more courses in successive semesters until 12 credit hours are earned.

Transfer Credit

Up to 6 credit hours of approved coursework may be transferred from other a master's and/or doctoral program from a college or university accredited by an accepted accrediting body. Only courses in which the student earned a grade of B or above (or its equivalent) can be transferred. Credit for thesis research cannot be transferred.

PHYSICS

• M.S. in Applied Physics

- Applied Physics
- Applied Optics

Department of Physics and Optical Science

physics.charlotte.edu

M.S. in Applied Physics

The Applied Physics degree program is excellent preparation for those planning to continue their education through the Ph.D., either in physics or an engineering field, or for a career as an instructor in a two-year college. Students electing the Thesis Option will be well qualified for employment in industry or in a research laboratory.

Students have opportunities for research in Biophysics, Computational Physics, Medical Physics, and Optics. The major research emphasis in the department is in the area of applied optics. The Department of Physics and Optical Science is the administrative coordinator of M.S. and Ph.D. programs in Optical Science and Engineering. These degree programs are interdisciplinary involving five science and engineering departments (Physics & Optical Science, Chemistry, Mathematics & Statistics, Electrical & Computer Engineering, and Mechanical Engineering & Engineering Science), the Center for Optoelectronics & Optical Communications, and the Center for Precision Metrology. A second area of emphasis is in biophysics, where there is a strong interdisciplinary relationship with the Ph.D. programs in Chemistry and Nanoscale Science, Biology, Bioinformatics and Computational Biology, and Applied Mathematics. The M.S. in Applied Physics program emphasizes basic and applied interdisciplinary education and research in many diverse areas that include:

- Statistical and computational physics
- Biological molecular motors
- Protein folding, stability, and dynamics
- Structural-based drug discovery
- Nuclear molecular resonance spectroscopy
- Micro-optics and nanophotonics
- Fiber and integrated optics
- Optoelectronic materials and devices
- Biomedical optics
- Optical interferometry and metrology
- Optical fabrication
- Nanoscale imaging and spectroscopy
- Adaptive optics
- Optical communication
- Novel light-matter interactions
- Quantum optics

- Optical sensors and measurements

A complete description of the programs and course offerings in Optical Science and Engineering can be accessed online at optics.charlotte.edu and under the "Optical Science and Engineering" heading in this section of the *Catalog*.

Admission Requirements

In addition to fulfilling the University's general requirements for graduate admission at the Master's level, applicants seeking admission into the M.S. in Applied Physics program must also:

- 1) Possess a Bachelor's degree in Physics, or a closely allied field, from a college or university accredited by an accepted accrediting body; applicants from fields other than Physics may expect to be required to remove deficiencies in their physics background
- 2) Present satisfactory scores on the GRE General Test (no subject test is required)
- 3) Possess an overall minimum GPA of 2.75 (based on a 4.0 scale) on all of the applicant's previous work beyond high school; the GPA in the major should be 3.0 or above
- 4) Present satisfactory scores on the Test of English as a Foreign Language, if the applicant is from a non-English speaking country
- 5) Demonstrate evidence of sufficient interest, ability, and preparation in physics to adequately profit from graduate study, as determined by the Physics Department's Graduate Committee

GRE Waiver

The GRE General Test requirement is waived for applicants who meet all other requirements and who are graduating from UNC Charlotte with a B.A. or B.S. degree in physics or who have graduated from UNC Charlotte with a B.A. or B.S. degree in physics within the past two years.

Early Entry Program

Exceptional undergraduate students at UNC Charlotte may apply for the Early Entry Program and begin work toward the graduate degree before completion of the baccalaureate degree. See the *Undergraduate Catalog* for details and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Early Entry Programs.

Accelerated Master's Program

Academically talented high school seniors and UNC Charlotte undergraduate freshmen are encouraged to apply for the Accelerated Master's Program to begin work toward both undergraduate and graduate degrees in their Freshman year. See the *Undergraduate Catalog* for details

and requirements. Also see the "Degree Requirements and Academic Policies" section of the *Graduate Catalog* for more information about Accelerated Master's Programs.

Degree Requirements

The M.S. in Applied Physics requires the completion of 30 credit hours approved by the Department of Physics and Optical Science. A minimum of 15 credit hours presented for the degree must be in courses numbered 6000 and above.

At the time of admission, up to 6 credit hours of graduate transfer credit may be accepted if approved by the Department of Physics and Optical Science and the Graduate School.

Students may, with departmental approval, apply up to 9 credit hours in non-cross-listed courses from graduate programs in related areas such as Bioinformatics, Biology, Chemistry, Engineering, Mathematics, and Nanoscale Science toward the 30 credit hour degree requirement.

All candidates for the degree must pass a final examination administered by their Advisory Committee.

Prerequisite Courses

Entering students not having the equivalent of PHYS 4222, PHYS 4232, or PHYS 4242 are required to take PHYS 5222, PHYS 5232, and/or PHYS 5242, as appropriate, before the end of their first year of residence. Courses for which undergraduate credit has been awarded may not be repeated for graduate credit.

Concentrations

There are two concentrations within the M.S. in Applied Physics program that include both thesis and non-thesis degree options:

- 1) Applied Physics Concentration (*Thesis or non-thesis option*)
- 2) Applied Optics Concentration (*Thesis option only*)

Thesis Option

The thesis defense is the final examination for students selecting the thesis option. Students selecting a concentration with a thesis option must present credit of at least 3 credit hours for each of the following courses:

PHYS 6991 - Physics Thesis Research I (3)
PHYS 6992 - Physics Thesis Research II (3)

Non-Thesis Option

Students selecting the non-thesis option must pass a final examination administered by their Advisory Committee. Example questions relating to subject matter for the examination are prepared by the Advisory Committee and

given to students at least 30 days prior to the examination date. Students prepare responses to these questions and make an oral presentation to members of the Committee that is based upon the prepared responses. Committee members may question students on any and all aspects of the relevant test material.

Degree Total = 30 Credit Hours

Grade Requirements

A minimum grade point average of 3.0 is required on all coursework attempted for the degree.

Admission to Candidacy

In addition to the general requirements for admission to candidacy, students enrolled in the Master of Science program in Applied Physics program should have:

- 1) Removed all identified entrance deficiencies by the time of application for admission to candidacy
- 2) Completed at least 18 approved credit hours with a GPA of 3.0 or above
- 3) Selected a major advisor and formed an advisory committee

Advisory Committee

Each student in the M.S. in Applied Physics Program must have a major advisor and an advisory committee. The student should select a major advisor before the end of the first year of residency. The student and the major advisor jointly determine the advisory committee. The advisory committee must have at least 3 members, the majority of which must be from the Department of Physics and Optical Science. The major advisor and the advisory committee must be in place prior to applying for degree candidacy.

Assistantships

Support for beginning graduate students is usually a teaching assistantship. Continuing students are often supported by research assistantships.



Course Descriptions

Graduate Course descriptions provide the following information:

- Subject prefix
- Course number
- Course title
- Credit hours assigned to the course
- Any course with which the course may be cross-listed
- Brief description of the course content
- If a course is graded as Pass/Unsatisfactory rather than with a letter grade
- Any restrictions on the number of times a course may be repeated
- Prerequisites and/or corequisites (if any)

For example:

SUBJ 6234. Title of Course. (Credit Hours) Pre/corequisites. Brief description of course content.

Course Prefix

Courses offered for academic credit are listed by number within each subject and the **subjects are listed alphabetically according to prefixes** which are assigned as listed in the following columns.

PREFIX	SUBJECT
ACCT	Accounting
ADMN	Educational Leadership/School Administration
AEEE	Applied Energy and Electromechanical Engineering
AFRS	Africana Studies
ARCH	Architecture
ARTE	Art Education
ATRN	Athletic Training
BDBA	Business Administration DBA
BINF	Bioinformatics
BIOL	Biology
BPHD	Business Administration Ph.D.
CEGR	Civil and Environmental Engineering
CHEM	Chemistry
CHFD	Child and Family Development

PREFIX	SUBJECT
CJUS	Criminal Justice and Criminology
CMET	Construction and Facilities Management
COAA	Arts & Architecture
COMM	Communication Studies
CSLG	Counseling
CUSU	Curriculum and Supervision
DSBA	Data Science and Business Analytics
ECGR	Electrical and Computer Engineering
ECON	Economics
EDCI	Education: Curriculum and Instruction
EDUC	Education
ELDT	Education: Learning, Design, and Technology
ELED	Elementary Education
EMGT	Engineering Management
ENGL	English

PREFIX	SUBJECT
ENGR	Engineering
EPID	Epidemiology
ESCI	Earth Sciences
ETGR	Engineering Technology
FINN	Finance
FLED	Foreign Language Education
FREN	French
GEOG	Geography
GEOL	Geology
GERM	German
GRAD	Graduate Life and Learning
GRNT	Gerontology
HADM	Health Administration
HCIP	Health Informatics and Analytics
HIST	History
HLTH	Public Health
HPSY	Health Psychology
HSRD	Health Services Research
IDST	Interdisciplinary Studies
INES	Infrastructure and Environmental Systems
INFO	Business Information Systems
INTE	Interpreting
ITCS	Computer Science
ITIS	Software and Information Systems
ITSC	Computing and Information Systems
KNES	Kinesiology
LANG	Languages, Cultures and Translation
LTAM	Latin American Studies
MAED	Mathematics Education
MATH	Mathematics
MBAD	Master of Business Administration
MDLG	Middle Grades Education
MDSK	Middle, Secondary, and K-12 Education
MEGR	Mechanical Engineering
MFPA	Fire Protection and Safety Management

MPAD	Public Administration
MSMG	Management
MSRE	Real Estate
MUDD	Urban Design
MUPF	Music Performance
MUSC	Music
NANO	Nanoscale Science
NUAN	Nurse Anesthesia
NUDN	Nursing Practice DNP
NUNP	Nurse Practitioner
NURS	Nursing
OPER	Operations Management
OPRS	Operations Research
OPTI	Optical Science and Engineering
OSCI	Organizational Science
PHIL	Philosophy
PHYS	Physics
PPOL	Public Policy
PSYC	Psychology
READ	Reading, Language, and Literacy
RELS	Religious Studies
RESP	Respiratory Care
RSCH	Educational Research, Measurement, and Evaluation
SECD	Secondary Education
SOCY	Sociology
SOWK	Social Work
SPAN	Spanish
SPED	Special Education
STAT	Statistics
TESL	Teaching English as a Second Language
TRAN	Translating and Translation Studies
WGST	Women's and Gender Studies

PREFIX	SUBJECT

Course Numbering System

Courses are identified by four-digit numbers. The first digit indicates the level of the course:

- 5000-5999 = graduate courses with parallel undergraduate courses listed at the 4000 level
- 6000-7999 = graduate certificate and master's level courses
- 8000-9999 = doctoral level courses

The following second digits designate special types of courses:

0 = topics

4 = internship, practica, clinical, and student teaching

5 = cooperative education

6 = seminars

7 = honors

8 = independent study

9 = research-based, thesis, and dissertation research

Prerequisites and Corequisites

A *prerequisite* is a requirement that must be met (or a course that must be passed) before enrolling in a more advanced course. A *corequisite* is a course which should be taken in the same semester as another.

Cross-Listed Courses

A *cross-listed course* is a single course which is simultaneously listed in the schedule of course offerings by one or more academic departments. They share the same meeting times, room, instructor(s), and curriculum. Therefore, ideally, they should also have the same course title. Students may only receive credit for the single section of the cross-listed course for which they are registered. Credit will not be awarded for a course where credit has been awarded for a cross-listed course.

Changes

Course descriptions and numbers are accurate at the time of publication of the Catalog. For the most current information, please consult with the academic department or the Class Schedule online at selfservice.charlotte.edu.

Accounting (ACCT)

ACCT 6121. Business Tax I. (3) Prerequisite(s): Admission to the MACC program. Core concepts of taxation of C Corporations, S Corporations, partnerships, and limited liability companies. Tax-exempt organizations will also be discussed.

ACCT 6122. Business Tax II. (3) Prerequisite(s): ACCT 6121 and Admission to the MACC program. Advanced topics related to tax planning and the taxation of corporations and partnerships.

ACCT 6150. Tax Strategy and Policy. (3) Prerequisite(s): ACCT 6121. Tax strategies in all phases of business operations, including creation of the business, choice of the type of business entity, financing, operations, distributions to owners, expansion, reorganization and liquidation with emphasis on minimizing taxes and avoiding tax traps. Analysis of business planning cases and completion of a comprehensive project with the results presented in both an oral and written report.

ACCT 6160. Advanced Individual Taxation. (3) Focuses on topics related to the taxation of individuals to enable the student to better advise taxpayers on these matters, identify problem areas and assist in tax planning matters to minimize the amount of tax due. Topics include: passive loss limitation rules, interest categorization and limitations, individual alternative minimum tax, individual net operating loss rules and rules concerning divorced taxpayers.

ACCT 6199. Topics in Taxation. (1 to 4) Topics in the area of taxation that go beyond the coverage in other existing courses by either addressing new tax issues or by delving more deeply into a tax topic. *May be repeated for credit with change in topic.*

ACCT 6220. Financial Statement Auditing. (3) Analysis of the accounting control systems and the independent auditor's examination of the system and other evidence as a basis for expressing an opinion on financial statements.

ACCT 6261. Advanced Financial Reporting and Analysis I. (3) An examination of advanced financial reporting topics including financial statements of for-profit and non-government not-for-profit entities, accounting for income taxes and leases, and fair value measurements and special purpose frameworks.

ACCT 6262. Advanced Financial Reporting and Analysis II. (3) Prerequisite(s): ACCT 6261. An examination of advanced financial reporting topics including accounting issues related to revenue recognition, stock compensation, derivatives and hedging, state and local government accounting, and financial statement analysis.

ACCT 6271. Accounting Research and Communication. (3) Prerequisite(s): Admission to MACC program. Research on accounting and auditing issues, and the oral and written communication of accounting and auditing processes and research results.

ACCT 6291. Financial Statement Analysis. (3) The analysis and interpretation of financial statements. This includes profitability and returns analysis, operating versus non-operating performance evaluation, credit analysis (liquidity and solvency), reformulation of financial statements, forecasting of financial statements, analysis of off-balance-sheet financing, analysis of intercorporate investments, cash flow analysis, accounting-based equity valuation, cash-based equity valuation, market-based valuation, assessing earnings quality and earnings management, mergers and acquisitions, assessment of intangible assets, and credit ratings of debt securities.

ACCT 6299. Topics in Financial Accounting and Auditing. (1 to 4) Topics in the area of financial accounting and auditing that go beyond the coverage in other existing courses by either addressing new issues or by delving more deeply into a topic. *May be repeated for credit with change in topic.*

ACCT 6340. Accounting Data Analytics. (3) Prerequisite(s): Admission to MACC program. An introduction to tools and techniques used to gain insight from accounting data. Students will focus primarily on descriptive and diagnostic analytics, the ETL process, and working with data stored in relational databases.

ACCT 6890. Directed Individual Study. (3) Prerequisite(s): Admission to the MACC program. Directed individual study and in-depth analysis of a special area of financial reporting, auditing or taxation. The course may be used to satisfy up to six credit hours of graduate credit requirements in the Master of Accountancy degree program. *May be repeated for credit with change of topic.*

Educational Leadership/School Administration (ADMN)

ADMN 6000. Topics in Educational Administration. (1 to 6) May include classroom and/or clinic experiences in the content area. *May be repeated for credit with permission of department.*

ADMN 6100. Fundamentals of Educational Leadership. (3) The developing role of educational organizations in the United States and the societal and cultural influences that affect the delivery of schooling. Structure and organization

of American schools, administrative and organizational theory, legal, moral, and ethical dimensions of schooling within the context of restructuring and reform.

ADMN 6101. Perspectives on Adult Learning Theory. (3)

Cross-listed Course(s): ADMN 8101. Prerequisite(s): Graduate standing and permission of department. The examination of how adults learn in instructional settings, with the characteristics of the adult learner explored. Students investigate adult learning theory as well as current trends and advancements in adult learning. The focus is on making better instructional decisions and media selections for the education and training of adults.

ADMN 6105. Legal Aspects of Schooling. (3) Education law for education professionals which focuses on the legal rights and responsibilities of students, teachers, and administrators and how these legal provisions affect educational policy and practice.

ADMN 6110. School Leadership and Management. (3)

Examination of school leadership and administration, focusing on the role, tasks, and responsibilities that accompany school-based leadership.

ADMN 6120. Instructional Leadership. (3) Examination of research-based teaching/learning models and the relationship between instructional decisions and curriculum experiences. Dynamics of group development and problems/practices related to providing instructional assistance to teachers.

ADMN 6130. Supervision of Instruction. (3) Introduction to clinical supervision and development of skills in classroom observation, analysis, evaluation, and assistance. Systems of observation, principles of adult development in school settings, techniques for conducting classroom observations and conferences, and development of staff development programs to remedy assessed weaknesses.

ADMN 6140. Curriculum Leadership. (3) Examination of internal and external influences on curriculum formation and development at the building level with emphasis on development of administrative strategies for curriculum decision-making which are driven by staff involvement.

ADMN 6161. The Principalship. (3) Examination of school administration focusing on the role, task and responsibilities associated with the principalship with special attention to the conceptual, human and technical skills associated with the principal.

ADMN 6170. Introduction to the Community College. (3) Cross-listed Course(s): ADMN 8170. An overview of the two-year college with an emphasis on the comprehensive community college. Content focuses on the history and evolution of the community college including origin,

culture, mission, structure, and governance. Special attention is paid to effective leadership and administration, finances, faculty, curriculum and instruction, student services and access, institutional effectiveness, community education, and economic development.

ADMN 6171. The American College Student. (3) Cross-listed Course(s): ADMN 8171. Prerequisite(s): Graduate standing and permission of department. An examination of issues related to the contemporary American college student. Topics include: a review of college student development theory, particularly related to identity and intellectual development, approaches to college student engagement, measures for student success, the social identity of college students, and differences among students from various higher education settings.

ADMN 6172. Higher Education in the United States. (3)

Cross-listed Course(s): ADMN 8172. Prerequisite(s): Graduate standing and permission of department. A review of the development of American higher education utilizing historical perspectives and relating them to the contemporary system. Topics include: college students, faculty, curriculum, governance, finance, and the context that informs change in American post-secondary education.

ADMN 6173. Legal Issues in Higher Education. (3) Cross-listed Course(s): ADMN 8173. Prerequisite(s): Graduate standing and permission of department. Examination of the legal context of American higher education and current legal issues of importance to higher education leaders, including legal requirements, legal rights, and legal allowances.

ADMN 6174. Higher Education Finance and Budgeting. (3)

Cross-listed Course(s): ADMN 8174. Prerequisite(s): Graduate standing and permission of department. Examination of issues at the center of contemporary discussions of higher education finance and the challenges facing the financing of higher education. Topics include: the economic environment of higher education, tuition and affordability, regulations and compliance, budgets, and policy implications.

ADMN 6175. Non-Traditional Approaches to Higher Education. (3)

Cross-listed Course(s): ADMN 8175. Prerequisite(s): Graduate standing and permission of department. Addresses new approaches to higher education that vary from the traditional higher education model. Examples include: online, for-profit, competency-based credit, corporate educational institutions, and satellite campuses in other states and countries. Access, funding, cost, quality, size, performance, and future directions of these non-traditional approaches are examined.

ADMN 6176. Women in Higher Education. (3) Cross-listed Course(s): ADMN 8176. Prerequisite(s): Master's standing and permission of the Department of Educational Leadership. An overview of the history, current research, and present condition of women students, faculty, administrators, staff, and leaders in higher education institutions in the United States. Includes an exploration of why and how women and men experience higher education differently, drawing on historical, cultural, social and theoretical contexts.

ADMN 6177. Student Affairs in Higher Education. (3) Cross-listed Course(s): ADMN 8177. An introduction to the student affairs profession within United States higher education. The primary topics include: history and development of student affairs, professional and institutional contexts, theoretical bases for the profession, organization of student affairs and functional units, essential competencies for student affairs educators, and contemporary issues affecting student affairs educators and college students.

ADMN 6178. Higher Education Policy and Governance. (3) Cross-listed Course(s): ADMN 8178. Examines a range of policy issues and governance issues regarding higher education.

ADMN 6179. Contemporary Issues in Higher Education. (3) Cross-listed Course(s): ADMN 8179. Examines a wide range of issues that are at the center of contemporary discussions of higher education.

ADMN 6180. Teaching Strategies for Adults in a Diverse Society. (3) Cross-listed Course(s): ADMN 8180. Prerequisite(s): Graduate standing and permission of department. Explores the practice of teaching adults in its complexity and variety. It is a study of methods and techniques employed in facilitating adult learning as well as an in-depth concentration of the role of philosophical orientation on teaching. Emphasis is placed on the process of designing and delivering effective individual and group learning experiences for adult learners, applying methods to learning objectives, the examining the role of the educators and their philosophies and the influence of context on the teaching of adults.

ADMN 6190. Curriculum in Higher Education. (3) Cross-listed Course(s): ADMN 8190. Prerequisite(s): Graduate standing. An overview of the practices, theories, and research related to academic course and program planning, development, and implementation in higher education institutions in the United States. Includes an exploration of faculty and administrators' educational roles and responsibilities, curricular innovation, curricular change, assessment and accreditation.

ADMN 6410. Internship and Seminar Part I. (1 to 9) An academic year internship in educational administration designed to allow theoretical and course-based practical learning to be translated and interwoven into a supervised field-based experience.

ADMN 6420. Internship and Seminar Part II. (1 to 9) A continuation of the internship experiences and seminar begun in ADMN 6410.

ADMN 6430. Internship and Professional Development in Higher Education. (3) Prerequisite(s): Enrollment in M.Ed. in Educational Leadership. Intended for master's students studying higher education as a complement to their concurrent participation in an internship in a supervised field setting.

ADMN 6490. Internship and Seminar: Administration. (3 to 6) Prerequisite(s): Permission of department. Internship under the supervision of University and on-site personnel in a setting consistent with the student's professional goals in which the student will be involved in the diverse activities expected of the professional administrator. Seminars are held concurrently.

ADMN 6491. Internship and Seminar: Supervision. (3 to 6) Prerequisite(s): Permission of the department. Internship under the supervision of University and on-site personnel in a setting consistent with the student's professional goals in which the student is involved in the diverse activities expected of the curriculum-instructional specialist. Seminars are held concurrently.

ADMN 6800. Individual Study in Educational Administration. (1 to 6) Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

ADMN 8000. Topics in Educational Leadership. (1 to 6) Major topics in educational leadership. *May be repeated for credit with change of topic and permission of department.*

ADMN 8101. Perspectives on Adult Learning Theory. (3) Cross-listed Course(s): ADMN 6101. The examination of how adults learn in instructional settings, with the characteristics of the adult learner explored. Students investigate adult learning theory as well as current trends and advancements in adult learning. The focus is on making better instructional decisions and media selections for the education and training of adults.

ADMN 8110. Organizational Theory and Behavior. (3) Prerequisite(s): Admission to Ed.D. in Educational Leadership. Analysis of the structure and organization of public education in the United States in terms of

organizational theory and historical development. Consideration of organizational change theory, organizational development, and the planning process.

ADMN 8120. Rethinking Education Reform: Law, Policy, and Public Schools. (3) Prerequisite(s): Admission to Ed.D. in Educational Leadership program or permission of instructor. Introduction to the elements of in-depth legal analysis, research, and writing of selected educational issues.

ADMN 8121. Doctoral Seminar in Curriculum Design. (3) Examination of principles and practices for educational leaders in program design, implementation and evaluation.

ADMN 8122. Advanced Curriculum Theory and Development. (3) An examination of philosophic thought and its relationship to educational theories which have led to assumptions for educational practices in American schools.

ADMN 8125. Doctoral Seminar in Instruction. (3) Analysis of models of teaching and the match between attributes of the models and the instructional outcomes desired by the teacher.

ADMN 8130. Educational Governance and Policy Studies. (3) Prerequisite(s): Admission to Ed.D. program in Educational Leadership. An examination of the institutional structure for policy-making in American education and the theories, models and practices that relate to policy-making in education.

ADMN 8140. School Finance. (3) Prerequisite(s): Admission to Ed.D. in Educational Leadership or permission of instructor. An examination of the theory and operation of public school finance systems and school business administration with special attention to local, state, and federal sources of revenue and such business functions as budgeting and financing capital outlay projects.

ADMN 8150. Human Resources Development and Administration. (3) Prerequisite(s): ADMN 8110 or initial licensure as school administrator. Examination of personnel administration in educational institutions, including administration of personnel at the school district level and its contribution to the overall management and operation of a school system.

ADMN 8160. Introduction to Educational Administration. (3) Examination of behavioral components of administrative theory, organization, decision-making and planning for educational development including appraisal of significant functions, techniques, practices and problems as they relate to public school systems, social institutions, and the system of social and governmental agencies.

ADMN 8170. Introduction to the Community College. (3) Cross-listed Course(s): ADMN 6170. Prerequisite(s): Admission to a doctoral program and permission of advisor and instructor. An overview of the two-year college with an emphasis on the comprehensive community college. Content focuses on the history and evolution of the community college including origin, culture, mission, structure, and governance. Special attention is paid to effective leadership and administration, finances, faculty, curriculum and instruction, student services and access, institutional effectiveness, community education, and economic development.

ADMN 8171. The American College Student. (3) Cross-listed Course(s): ADMN 6171. Prerequisite(s): Doctoral standing and permission of department. An examination of issues related to the contemporary American college student. Topics include: a review of college student development theory, particularly related to identity and intellectual development, approaches to college student engagement, measures for student success, the social identity of college students, and differences among students from various higher education settings.

ADMN 8172. Higher Education in the United States. (3) Cross-listed Course(s): ADMN 6172. A review of the development of American higher education utilizing historical perspectives and relating them to the contemporary system. Topics include: college students, faculty, curriculum, governance, finance, and the context that informs change in American post-secondary education.

ADMN 8173. Legal Issues in Higher Education. (3) Cross-listed Course(s): ADMN 6173. Prerequisite(s): Doctoral standing and permission of department. Examination of the legal context of American higher education and current legal issues of importance to higher education leaders, including legal requirements, legal rights, and legal allowances.

ADMN 8174. Higher Education Finance and Budgeting. (3) Cross-listed Course(s): ADMN 6174. Prerequisite(s): Doctoral standing and permission of department. Examination of issues at the center of contemporary discussions of higher education finance and the challenges facing the financing of higher education. Topics include: the economic environment of higher education, tuition and affordability, regulations and compliance, budgets, and policy implications.

ADMN 8175. Non-Traditional Approaches to Higher Education. (3) Cross-listed Course(s): ADMN 6175. Prerequisite(s): Doctoral standing and permission of department. Addresses new approaches to higher education that vary from the traditional higher education model. Examples include: online, for-profit, competency-

based credit, corporate educational institutions, and satellite campuses in other states and countries. Access, funding, cost, quality, size, performance, and future directions of these non-traditional approaches are examined.

ADMN 8176. Women in Higher Education. (3) Cross-listed Course(s): ADMN 6176. Prerequisite(s): Doctoral standing and permission of Department of Educational Leadership. An overview of the history, current research, and present condition of women students, faculty, administrators, staff, and leaders in higher education institutions in the United States. Includes an exploration of why and how women and men experience higher education differently, drawing on historical, cultural, social and theoretical contexts.

ADMN 8177. Student Affairs in Higher Education. (3) Cross-listed Course(s): ADMN 6177. An introduction to the student affairs profession within United States higher education. The primary topics include: history and development of student affairs, professional and institutional contexts, theoretical bases for the profession, organization of student affairs and functional units, essential competencies for student affairs educators, and contemporary issues affecting student affairs educators and college students.

ADMN 8178. Higher Education Policy and Governance. (3) Cross-listed Course(s): ADMN 6178. Examines a range of policy issues and governance issues regarding higher education.

ADMN 8179. Contemporary Issues in Higher Education. (3) Cross-listed Course(s): ADMN 6179. Examines a wide range of issues that are at the center of contemporary discussions of higher education.

ADMN 8180. Teaching Strategies for Adults in a Diverse Society. (3) Cross-listed Course(s): ADMN 6180. Prerequisite(s): Doctoral standing and permission of department. Explores the practice of teaching adults in its complexity and variety. It is a study of methods and techniques employed in facilitating adult learning as well as an in-depth concentration of the role of philosophical orientation on teaching. Emphasis is placed on the process of designing and delivering effective individual and group learning experiences for adult learners, applying methods to learning objectives, examining the role of the educators and their philosophies, and the influence of context on the teaching of adults.

ADMN 8181. Values & Integrative Leadership Practices. (3) Engages learners in critical thought and discussion around key issues and themes in educational leadership praxis. The course encourages reflection on how various personal values and social factors—such as background, experiences, and environment, can influence leadership

and decision-making practices. Learners explore how leadership is influenced by broader societal structures and individual circumstances such as the intersection of place, opportunity, and education. Emphasis is placed on understanding the complex role as a leader and the integrative process that considers both the learner and the educator within different contexts.

ADMN 8190. Curriculum in Higher Education. (3) Cross-listed Course(s): ADMN 6190. An overview of the practices, theories, and research related to academic course and program planning, development, and implementation in higher education institutions in the United States. Includes an exploration of faculty and administrators' educational roles and responsibilities, curricular innovation, curricular change, assessment, and accreditation.

ADMN 8410. Advanced Internship in Educational Leadership Part I. (3) Prerequisite(s): ADMN 8110, ADMN 8120, and ADMN 8140. Internship experiences planned and guided cooperatively by University and school personnel, including some work in private, community, or social service organizations. Accompanying cohort seminar for integrating and synthesizing knowledge and skills useful to practicing school leaders.

ADMN 8420. Advanced Internship in Educational Leadership Part II. (3) Prerequisite(s): ADMN 8410. Continuation of ADMN 8410.

ADMN 8439. Practicum in Adult Education. (3) Prerequisite(s): ADMN 8101, admission to the doctoral program, and permission of the advisor and instructor. Explore and expand an identified area of adult education that builds on professional and/or academic experiences previously engaged in or studied. Includes a variety of activities and experiences developed by the student in consultation with the instructor. These enable students to extend skills or develop new competencies as they work with adults in selected contexts in the community. *May be repeated for credit two times.*

ADMN 8489. Practicum in Staff Development. (3) Examination of techniques of delivering in-service training and development of leadership for in-service educational programs including design and implementation of a staff development program in a school setting.

ADMN 8610. Interdisciplinary Seminar. (3) Prerequisite(s): Admission to Ed.D. in Educational Leadership. Ideas, values, cultures, and contemporary issues affecting society generally and education particularly and principles and practices for responding to the public with whom school leaders interact. *May be repeated for credit.*

ADMN 8611. Applied Dissertation Pre-Proposal Development. (3) Prerequisite(s): Admission to Ed.D. in Educational Leadership. Incorporates the principles of scholarly productivity to help doctoral students design and communicate a rationale for research as well as summary of methods to be used related to their individual areas of scholarly productivity.

ADMN 8660. Instructional Leadership Seminar. (3) Investigation and evaluation of current trends and issues in instruction as they relate to the role of the educational leader, with special attention to the role of facilitating the teaching/learning process.

ADMN 8695. Advanced Seminar in Teaching and Learning. (3) Examination of a number of current teaching models to provide a framework for choosing those appropriate for a given classroom setting with special attention to the relationship between teaching strategies and learning outcomes.

ADMN 8699. Dissertation Proposal Seminar. (3) Prerequisite(s): Completion of research requirements. Identification and definition of a research area and development of a proposal draft for an original research study appropriate for the dissertation requirement.

ADMN 8800. Individual Study in Educational Administration. (1 to 6) Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

ADMN 8999. Dissertation Research. (1 to 6) Prerequisite(s): Permission of Ed.D. Program Director. Execution of original research study that addresses the solution to an educational or school-related problem or that addresses a substantive educational leadership or programmatic issue. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Africana Studies (AFRS)

AFRS 5000. Special Topics in Africana Studies. (3) Intensive survey of a topic in African, African American, or the broad African Diaspora studies, depending on the needs of student and staff resources. *May be repeated for credit with change of topic.*

AFRS 6610. Diaspora and Transnational Theories. (3) Focuses on the dialectical relationships between the social theories of nation, state, ethnicity, identity, race, and culture on one hand and the emerging theorizing of the diaspora and transnational networks on the other. The historical contexts that have shaped the African Diaspora

and the more recent global transnational networks will be emphasized throughout the course.

AFRS 6630. Graduate Colloquium. (3) Prerequisite(s): prior written permission of instructor and Graduate Program Director. Focuses on an interdisciplinary theme that combines two or more of the following: literature, language, politics, health issues, social policy, education, popular culture, history, performance theory, pedagogy, etc. Students write short papers and reports directed toward developing breadth in the theoretical and empirical understanding of a topic in Africana Studies using interdisciplinary approaches. *May be repeated for credit with change of topic.*

AFRS 6901. Directed Readings/Research. (3) Prerequisite(s): prior written permission of instructor and Graduate Program Director. A directed research on a specific theme in Africana Studies. Students will produce a publishable essay at the end of the semester based on original research. The goal is for students to develop research, theoretical and analytical depth in an area of study in Africana Studies. *May be repeated for credit with change of topic.*

Anthropology (ANTH)

ANTH 5020. Topics in Cultural Anthropology. (3) Prerequisite(s): Permission of instructor. Specialized topics in Cultural Anthropology. Examples include: Field Methods in Medical Anthropology; Semiotics and Culture. *May be repeated for credit with change of topic.*

ANTH 5040. Topics in Biological Anthropology. (3) Prerequisite(s): Permission of instructor. Specialized topics in Biological Anthropology. Examples include: Chromosomal Evolution in the Chimpanzees; Ecologies of Southeast Asian Primates. *May be repeated for credit with change in topic.*

ANTH 5050. Topics in Archaeology. (3) Prerequisite(s): Permission of instructor. Specialized topics in Archaeology. Examples include: Radiometric Dating Techniques; Early State Expansion in the Andes. *May be repeated for credit with change of topic.*

ANTH 5090. Topics in Anthropology. (3) Prerequisite(s): Permission of instructor. Intensive treatment of a topic in anthropology or survey of related topics. Examples: Religion, Art, and Archaeology; Islam and Globalism. *May be repeated for credit with change of topic.*

ANTH 5120. Intercultural Communications. (3) Prerequisite(s): ANTH 1101 or permission of instructor. Learning to cope with cultural differences; contrasting value systems; cross-cultural communication styles;

nonverbal communication; cultural relativity; culture and business; ethnocentrism; cultural shock.

ANTH 5122. Ethnographic Methods. (3) Designed to introduce students to the methodological approaches used in ethnography and to provide a basic mastery of several key methods used in ethnographic research. Includes a discussion of the nature of inquiry in the social sciences; the development and implementation of different kinds of research designs to investigate a range of questions; issues of sampling and informant selection; research ethics; participant observation, interviewing techniques; data management and analysis.

ANTH 5131. Culture, Pregnancy, and Birth. (3) Cross-listed Course(s): WGST 5131. Explores how culture shapes the experience and practice of pregnancy and birth. Some of the topics explored include the birthing experience, midwifery, infertility, new reproductive technologies, and surrogate motherhood.

ANTH 5140. Field Biology of the Primates. (3) The theory and methods utilized in the study of nonhuman primate behavior. This applied behavioral primatology course entails original research projects done at an appropriate zoological venue in North and South Carolina.

ANTH 5453. Field Project in Archaeology. (1 to 4)
Prerequisite(s): Permission of instructor. Practical experience in archaeological techniques. Students participate in field research on an historic or prehistoric archaeological site. Research may include field reconnaissance, excavation, mapping, systematic description and analysis of cultural material, and/or other techniques appropriate to the site and research problem. Students supervise undergraduates under the guidance of the instructor. *May be repeated for credit with up to 6 credits applied to the M.A. degree.*

ANTH 5615. Seminar in Middle East Ethnography. (3)
Seminar exploring both historically significant and recent ethnographies on selected topics. Examples include Israel/Palestine, Women in the Middle East, and Tribe, State, and Nation in the Middle East. *May be repeated for credit with change of topic.*

ANTH 5622. Seminar in the Ethnography of Religion. (3)
Seminar exploring both historically significant and recent ethnographies on the anthropology of religion.

ANTH 5641. Bioarchaeology Methods. (3) Introduction to methods that bioarchaeologists use to learn about people's lives and deaths from human skeletal remains. Includes reading bioarchaeological and forensic case studies and research articles, and applying this knowledge to investigate cases in the University's forensic collection. By the end of the course, students are able to analyze a

skeleton for demographic characteristics, paleopathology, trauma, and other cultural identifiers. They are additionally able to read and interpret bioarchaeological articles and critique the methods, interpretations, and conclusions.

ANTH 6010. Advanced Topics in Cultural Anthropology/Linguistics. (3) Prerequisite(s): Permission of the department. Intensive treatment of a topic in cultural anthropology or linguistic anthropology, depending on student needs and faculty resources. *May be repeated for credit.*

ANTH 6040. Advanced Topics in Biological Anthropology. (3) Prerequisite(s): Permission of the department. Intensive treatment of a topic in biological anthropology, depending on student needs and faculty resources. *May be repeated for credit.*

ANTH 6050. Advanced Topics in Archaeology. (3)
Prerequisite(s): Permission of the department. Intensive treatment of a topic in archaeology, depending on student needs and faculty resources. *May be repeated for credit.*

ANTH 6400. Anthropology Practicum. (3) Prerequisite(s): Permission of the department. Pre- or Corequisite(s): ANTH 6611. Supervised practical experience in the application of anthropological principles in an agency, organization, or facility not part of the department. Following the needs of the agency, students will conduct applied research and write a report as part of this practicum. *May be repeated for credit; 6 credits may be applied to the M.A. degree program.*

ANTH 6401. Teaching Anthropology. (3) Methods and skills for teaching undergraduate students. Students examine and practice teaching skills and classroom procedures. Includes preparation of model teaching materials, such as syllabi, and practice teaching.

ANTH 6601. History of Anthropology. (3) Development of the field of anthropology; key concepts, focusing on concepts of "race" and "culture;" debates in anthropological method and theory; implications for ethical practice in contemporary anthropology.

ANTH 6603. Theory in Social and Cultural Anthropology. (3) Discussion of major works that form the theoretical foundation of contemporary social and cultural anthropology.

ANTH 6604. Issues in Archaeological Practice. (3)
Exploration of current theory and practice in anthropological archaeology. Topics include: major theoretical perspectives; the relationship of theoretical choices with the formation of research problems and choice of research methods; discussion of the legal and ethical framework of contemporary archaeology;

examination of the influence of multiple stakeholders on the practice of archaeology.

ANTH 6605. Evolutionary and Biological Anthropology. (3) Discussion of theories, concepts, and controversies informing biological anthropology, including evolutionary theory as applied to primate and human evolution, behavioral ecology, genetics, and modern human variation.

ANTH 6606. Language and Culture: Foundational Issues in Linguistic Anthropology. (3) Discussion of the theories, concepts, controversies, and major findings of linguistic anthropology. Includes an analysis of the difference between human and non-human communication, semiotics, language and thought, the nature of meaning, language socialization, language variation, language and power, and multilingualism, as well as linguistic change. No prior training in linguistics is assumed, presupposed, or required.

ANTH 6611. Seminar in Applied Anthropology. (3) Theories, methods, and ethics of applied anthropology in medical, educational, business, and development fields. Cultural perspective on the program evaluation in community settings; culturally competent evaluations using ethnographic methods; role of anthropology in program development and evaluation at the regional, national, and international levels.

ANTH 6612. Theoretical Approaches to Gender. (3) Cross-listed Course(s): WGST 6602. An interdisciplinary examination of the core theories about the role of gender in identity formation and social organization. Topics covered include the feminist critique of biological essentialism; gender as a continuum; the social construction of gender; gender performativity; historical changes in gender; masculinity studies; the intersection of race, class and gender; and the economics of gender.

ANTH 6613. Seminar in Medical Anthropology. (3) A graduate seminar in medical anthropology that explores the relationship between mind, body and society. Students begin with learning about the centrality of culture and belief when studying health and illness across different cultures. Central theories and key concepts in medical anthropology are defined and critiqued, such as cultural relativism, ethnocentrism, the political economy of health, structural violence, symbolic violence, critical medical anthropology, and illness narratives. These concepts are used to examine contemporary health issues.

ANTH 6800. Directed Readings/Research. (1 to 3) Prerequisite(s): Permission of the department. Study of specialized topic through individually designed reading program and scheduled conferences with a faculty member. *May be repeated for credit.*

ANTH 6910. Thesis Tutorial. (3) Prerequisite(s): Permission of the Graduate Program Director. Independent study with a faculty advisor, to conduct research for the M.A. thesis.

ANTH 6920. Master's Thesis. (3) Prerequisite(s): Admission to candidacy and permission of the Graduate Program Director. Preparation of master's thesis under the supervision of the thesis committee. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit up to 6 credits.*

Applied Energy and Electromechanical Engineering (AEEE)

AEEE 5000. Special Topics. (1 to 3) Cross-listed Course(s): ENER 4000. Builds upon and synthesizes the knowledge that the students have gained from their curriculum. The specific topics covered in each separate offering of the course will broaden and deepen students' knowledge in general areas related to Applied Energy and Electromechanical Engineering. *May be repeated for credit.*

AEEE 5010. Special Topics in Energy. (1 to 3) Builds upon and synthesizes the knowledge that the students have gained from their curriculum. The specific topics covered in each separate offering of the course will broaden and deepen students' knowledge in areas of Energy Engineering. *May be repeated for credit with change of topic.*

AEEE 5020. Special Topics in Electromechanical. (1 to 3) Builds upon and synthesizes the knowledge that the students have gained from their curriculum. The specific topics covered in each separate offering of the course will broaden and deepen students' knowledge in areas of Electromechanical Engineering. *May be repeated for credit with change of topic.*

AEEE 5123. Signal Conditioning and Filtering. (3) The design, analysis, simulation, and implementation of composite, cascaded and summation filters. Topics include: bilinear transfer functions; cascade design with first-order circuits; biquad circuits; Butterworth lowpass circuits; Butterworth bandpass circuits; the Chebyshev response; sensitivity; frequency transformations; high-pass and band-elimination filters .

AEEE 5140. Energy Management. (3) Study of the understanding and implementation of energy management

techniques. Emphasis is on energy efficiency applications in homes, businesses, large buildings and industry. Topics include: energy auditing, energy management, energy cost analysis, energy and electric rate structures, lighting, HVAC systems, motors and drivers, boilers and steam systems, cogeneration, commercial and industrial applications, and alternative energy sources.

AECE 5150. Manufacturing Automation. (3) Theory and application of technologies for manufacturing automation. Topics include: Manufacturing Process Operations, Process/System Automation, Industrial Control Systems, Automation and Process Control Elements (Sensors and Actuators), Programmable Logic Controller (PLC), Industrial Robotics, and Computer Numerical Control (CNC).

AECE 5152. Discrete-time Signals and Systems. (3) Cross-listed Course(s): ELET 4152. Discrete-time signals; discrete-time systems; Linear constant-coefficient difference equations; Periodic sampling; reconstruction from samples; changing the sampling rate; the z-transform; z-transform properties; transform analysis of linear time-invariant systems; digital filter design techniques; discrete Fourier Transform and the FFT algorithm.

AECE 5155. Agile Design of Automated Systems. (3) Applies the principles of agile design to the realization of electro-mechanical systems. Traditional waterfall approaches are reviewed as a contrast to the agile methods. Ideation, modeling, and evaluation techniques are presented and students will work through projects in multiple scrum sprints, consisting of implementation, review, and retrospective.

AECE 5196. Introduction to Robotics. (3) Cross-listed Course(s): ECGR 5196. Introduction to the broad field of robotics, including industrial assembly robots, autonomous vehicles, and entertainment robots. Emphasis on the basic technologies and integration of mechanical, electrical, and software sub-systems into a complete device.

AECE 5250. Analysis of Renewable Energy Systems. (3) System analysis of renewable energy systems: well-to-wheels analysis, lifecycle energy and emissions, total cost, skill sets, methodologies and tool kits needed to analyze various technologies on a consistent basis for a given application. Topics include: solar photovoltaics, wind energy, and fuel cell technologies.

AECE 5265. Solar Photovoltaic Systems. (3) Basic concepts, tools, techniques, and materials required to design photovoltaic (PV) systems. Topics include solar resources, solar cells, PV modules, mounting, system sizing, inverters, conductor sizing, commissioning, and electrical safety.

AECE 5270. Cyber-physical Systems. (3) Modeling, analysis and design of cyber-physical systems (CPS). The course

serves as an introductory graduate level-class for students interested in CPSs in general, and control and optimization of CPSs in specific. The fundamentals of CPSs are covered in the class, with emphasis on the control and the optimization aspects. Covered CPS topics include: networked control systems, cyber-attacks, linear systems theory and design, state-estimators, fault-tolerant controllers and observers, and convex, multi-objective, bi-level & multi-time scale optimization. Applications in smart-grids are discussed.

AECE 5274. Applied Computational Methods. (3) Introduction to computational method concepts, uses, and limitations to support the selection of techniques for specific engineering applications. Lays a foundation for students to engage in further study and/or research projects that involve numerical methods. Numerical methods pertain to a branch of mathematics that solves continuous problems using numeric approximation. It involves designing algorithms that give approximate but accurate numeric solutions, which is useful in cases where the exact solution is impossible or prohibitively expensive to calculate. Students use standard engineering applications (e.g., MATLAB) to implement the computational methods covered in this course; prior experience with a specific software application is not required.

AECE 5275. Building Environmental Systems. (3) Functions and operating characteristics of the major components of refrigerating machines, heat pumps, boilers, furnaces, solar collectors, heat exchangers, fans and pumps. Emphasis on sizing, economics and performance characteristics. Includes coverage of psychometric principles and fan and pump laws.

AECE 5285. Applied Noise and Vibration Control. (3) Laplace transformation method for solution of differential equations. Review of Newton's 2nd Law of Motion. Solution to the free vibration problem both with and without damping. Introduction to acoustics and the one dimensional solution to the wave equation. Noise sources and mechanics of noise generation. System design for noise and vibration minimization. Methods of noise and vibration remediation.

AECE 5290. Advanced Instrumentation. (3) Methodologies for measurement, analysis, and control of physical components of various electromechanical systems as well as conventional and renewable energy conversion and storage systems.

AECE 5295. High Voltage Technology. (3) Covers concepts of high voltage generation, measurements, protection and safety. Study of high electric fields theory, breakdown mechanisms in gases, liquids, and solid dielectrics. The high voltage insulation, including insulation coordination, is also

discussed. Instruction on high voltage applications and safety.

AEEE 6120. Energy Generation and Conversion. (3)

Overview of energy use. Fossil fuel resources and energy conversion. Solar energy principles, solar collector, photovoltaic cells and applications. Wind energy and wind turbines. Nuclear energy principles, nuclear reactors and power generation. Geothermal and Hydraulic energy conversion. Hydrogen energy, storage, and transportation. Overview of fuel cell, fuel cell types, and application.

AEEE 6135. Energy Transmission and Distribution. (3)

Power transmission and distribution network architectures. Transmission line models, parameters, and equivalent circuits. Symmetrical components. Power flow studies. Symmetrical and unsymmetrical faults. Transient operation and power system protection. Power system stability. Distribution optimization.

AEEE 6150. System Dynamics. (3)

Energy-based modeling of dynamic mechanical, electrical, thermal, and fluid systems to formulate linear state equations, including system stability, time domain response, and frequency domain techniques.

AEEE 6170. Applied Mechatronics. (3) Mechatronics is the intersection of electronics, mechanical systems, controls, and computer programming. Various elements are studied for purposes of controlling electromechanical systems, including electromechanical sensors and actuators, analog and digital electronic design of filters, state-space and classical controllers, and methods of programming. Theoretical and hands-on problem-solving activities are emphasized.

AEEE 6235. Modern Electric Power Grids. (3) Instruction on network steady-state analysis; faults; protection systems; switching equipment; voltage and power static control; surge voltages and protection, transient operation and stability, "smart grid" enabling technologies.

AEEE 6260. Thermal Fluid Systems Modeling. (3)

Introduction to the use of commercial CFD codes to analyze flow and heat transfer in energy related problems. Finite difference and finite volume methods, SIMPLE model for incompressible flow, models of simple geometries are developed and studied, post processing and visualization. Overview of turbulence and turbulence modeling.

AEEE 6270. Dynamic Systems Control and Design. (3)

Analysis and design of dynamic systems control. Analysis of linear feedback systems, deterministic and stochastic dynamic systems, their characteristics, robust stability, and robust performance. Robust control, Kalman filter, and its design and compensation of deterministic and stochastic

dynamic systems, including wind turbines system control and piezo (mechatronics) systems.

AEEE 6800: Independent Study. (1 to 3)

Prerequisite(s): Permission of graduate committee advisor. Individual investigation and exposition of results for a directed project in energy and electromechanical systems. *May be repeated for credit.*

AEEE 6850. Capstone Project. (3)

Prerequisite(s): Completion of at least 9 credit hours in the Applied Energy and Electromechanical Systems program. Individual investigation in the form of a project in the areas of Applied Energy and/or Electromechanical Systems culminating in an exposition of results in the form of a formal presentation to faculty and a professional conference-formatted paper. The proposed project must be pre-approved by a mentoring member of the program faculty and the Graduate Program Director.

AEEE 6900: Master's Research and Thesis. (1 to 6)

Prerequisite(s): Permission of Graduate Program Director. Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

AEEE 6901. Master's Research & Thesis I. (3)

Prerequisite(s): Must have completed Appointment of the Master's Thesis Committee. Having completed a Master's Thesis Proposal, the student performs individual investigation under the direction of a Master's Thesis Committee. Research is conducted and parts of the thesis document are written.

AEEE 6902. Master's Research & Thesis II. (3)

Prerequisite(s): AEEE 6901. The student continues individual investigation under the direction of a Master's Thesis Committee. Research is concluded; the thesis document is completed and then defended in an oral presentation.

Architecture (ARCH)

ARCH 5000. Foreign Study. (3 to 6) Summer or semester break faculty-led educational experience abroad to support growing knowledge of global architectural, urban, and or heritage discourse and practice. *May be repeated for credit with change of topic.*

ARCH 5050. Architecture Topics. (1 to 6) Cross-listed Course(s): ARCH 4050. Architectural elective topics are available in a wide variety of subjects. Topics include: Computation, Theory, Representation, Making, Urbanism, and Technology. *May be repeated for credit with change in topic. Students may enroll in duplicate sections each semester.*

ARCH 5060. History/Theory Topics. (3) Cross-listed Course(s): ARCH 4204, ARCH 5600. Topics are available in a wide variety of subjects in architectural history and theory, in which students develop in-depth research, writing, and presentation skills. *May be repeated for credit with change of topic. May enroll in duplicates in the same semester.*

ARCH 5201. Architectural History I: Prehistory-1750. (3) Global survey of architecture and urbanism from prehistory to 1750. Explores key examples of buildings and cities as well as the theoretical, environmental, political, economic, technological, and cultural context in which they were built. Provides a general knowledge of the formal, spatial and ornamental characteristics that distinguish the built environment of distinct historic and traditional building cultures.

ARCH 5202. Architectural History II: 1750-Present. (3) Prerequisite(s): ARCH 5201 or permission of instructor. Global survey of architecture and urbanism from 1750 to the present. Explores key architectural and urban ideas, designers, buildings, and urban projects as well as how they were shaped by their environmental, political, economic, technological, and cultural context.

ARCH 5203. Architectural History III: Survey of Contemporary Theory (1950-Present). (3) Prerequisite(s): ARCH 5202 or MII Standing. Cross-listed Course(s): ARCH 4203. Survey of architecture theory from 1950 to the present. Focuses on the key ideas, texts, debates, and discourse that have informed architectural practice in the late twentieth and early twenty-first century.

ARCH 5206. Professional Practice. (3) An introduction to the objectives of the practice of architecture, its responsibilities and procedures, and emerging alternative forms of practice and as they pertain to the role of the architect.

ARCH 5301. Materials and Assembly Principles. (3) Introduces the quantitative and qualitative characteristics of architectural materials, systems, and processes. Students are introduced to the physical properties of materials relevant to their application in construction, assembly, and detail systems. Topics include: masonry, concrete, wood, steel, glass, cladding, and roofing and flooring materials and their assemblies.

ARCH 5302. Environmental Systems Principles. (3) Prerequisite(s): ARCH 5301 or permission of instructor. Introduces qualitative and quantitative analytical methods commonly used to assess the impact of environmental forces on occupant thermal and luminous comfort, energy performance, and regional sustainability. Students are introduced to the interplay between climatic events,

patterns of building use, and the architectural variables that inform the appropriate application of building systems technology. Topics include: building envelope performance, and the introduction of passive and mechanical systems for heating, cooling, illuminating, and ventilating buildings.

ARCH 5303. Structural Principles. (3) Cross-listed Course(s): ARCH 4303. Introduces issues relevant to the fundamentals of structures including statics, strength, and stability of materials. Students will be introduced to structural concepts, systems, and the tracing of structural loads through basic principles, physical modeling, and theoretical and analytical methods. Topics include: interrelationship between strain, stress, and stability, as well as the implications of tension, compression, shear, torsion, and bending.

ARCH 5304. Structural Systems. (3) Prerequisite(s): ARCH 5303. Introduces specific structural applications of wood, steel, concrete, and masonry systems commonly used in small-scale commercial/institutional buildings. Students are introduced to the design of beams, columns, walls, joinery, and connections appropriate to each material type through theoretical, analytical, and computer simulation methods.

ARCH 5305. Building Systems Integration. (3) Introduces a set of advanced issues related to the comprehensive, systemic integration of building technology systems commonly used in large-scale buildings through case study, analytical, and simulation methods. Topics address the resolution of building structure, materials, environmental systems, mechanical systems, electrical systems, life safety, building water supply and waste, and conveying systems in building design.

ARCH 5600. Critical Approaches to Heritage. (3) Cross-listed Course(s): ARCH 4204, ARCH 5204. A theoretical exploration of heritage from a variety of disciplinary and methodological perspectives with a focus on key contemporary issues and themes in the field and engagement with alternative intellectual and methodological frameworks to reconceptualize heritage values and practices.

ARCH 5601. Ideas in Architecture. (3) The fundamental concepts, issues, and working knowledge specific to design in architecture. Topics include: order, form and space, site, type, and architectural meaning.

ARCH 5604. Computational Methods. (3) Cross-listed Course(s): ARCH 4604. Introduces students to the fundamental concepts of computation through explorations with basic scripting and parametric tools. The goal is to understand the potential of computation and the role it can play as part of one's design process, not as a

collection of specific tools, but as a way of thinking about design.

ARCH 5605. Computational Practice. (3) Prerequisite(s): ARCH 5604 or permission of instructor. Capstone course for digital media and computational studies in the School of Architecture. The goal of this seminar course is to provide students with experience using advanced digital tools and methods, including digital fabrication, parametrics, Building Information Modeling/Management (BIM), scripting, and performance analysis in preparation for professional practice and/or advanced graduate research.

ARCH 5606. Scripting. (3) Teaches students how to apply scripting as one might within a professional setting: understanding discipline-specific procedures and problems, planning and developing scripts, testing, debugging, and supporting scripts within a production environment. Students gain an understanding of how scripting can support professionals in their daily work by improving productivity and enabling innovation.

ARCH 5607. Digital Fabrication. (3) Cross-listed Course(s): ARCH 8607. An introduction to the use of parametric software and the use of digitally controlled fabrication. Emphasizes both the development of complex building components in modeling software and the construction of those components using laser cutter, CNC routers and plasma cutters, 3D printers, and other equipment.

ARCH 5611. Computational Research Methods. (3) An overview of the fundamental concepts of design computation through explorations with methods such as parametric software and scripting. Students study these methods in the context of emerging areas of architectural technology research such as Building Information Modeling (BIM), digital fabrication, building performance optimization, and generative design, among others.

ARCH 5612. Research Methods II. (3) A historical survey of the dominant theoretical rubrics designers have used to integrate ideas into architectural research and explores their relevance for contemporary practice. The design and research methods explored in this seminar vary based on specific concentrations and specializations of students and faculty participating.

ARCH 6050. Architecture Topics. (1 to 6) Cross-listed Course(s): ARCH 8050. Architectural Electives are available in a wide variety of subjects. Topics include: Computation, Theory, Representation, Making, Urbanism, and Technology. *May be repeated for credit with change of topic. May enroll in duplicates in the same semester.*

ARCH 6101. Design Studio: Fundamentals. (6) Corequisite(s): ARCH 6602. An introductory architectural design studio

that focuses on fundamental concepts of architecture, as well as the acquisition and practice of a wide range of technical and graphic skills and media. It is intended to complement the reading and writing engaged in ARCH 5601 and to serve as an arena to explore and test the issues encountered in that course through the act of making.

ARCH 6102. Design Studio: Fundamentals. (6)

Prerequisite(s): ARCH 6101. Corequisite(s): ARCH 6603. An introductory architectural design studio that focuses on the development of site, space, and design process issues, as well as the continued acquisition and practice of a variety of technical and graphic skills. Exploration into the creative and appropriate use of a variety of media is addressed.

ARCH 6103. Design Studio: Basics. (6) Prerequisite(s):

Enrollment in Master of Architecture in MI Concentration. Graduate studio for 3+ year M.Arch. students following the first full year of study. This intensive studio-based course allows for a variety of topical studio learning options, including: summer study travel abroad, design building activities, and other design-related projects and activities.

ARCH 6306. Technology Topic. (3) Focuses on the study of topical areas of technology in architecture. Provide an in-depth extension of the five required technology courses. The course may be selected from a number of designated technology courses that examine specific issues contributing to architecture as a process of investigation, innovation, analysis and/or research. *May be repeated for credit with change of topic.*

ARCH 6400. Architecture Internship. (1 to 6) Supervised practical experience in the application of architectural, urban, or heritage principles in a design firm, agency, organization, or facility not part of the School of Architecture. Following the needs of the agency, as part of the internship students may be asked to set goals at the outset of their applied research, complete a self-assessment at the end, and/or submit documentation of their experiential learning. *May be repeated for credit.*

ARCH 6600. Heritage Colloquium. (2) Prerequisite(s):

Admission to the MS in Architecture concentration in Critical Heritage Studies. Heritage Studies concentration course involving a series of site visits and guest speakers from scholars and professionals to further understanding of heritage case studies and working in the discipline. *May be repeated for credit.*

ARCH 6601. Ideas in Architecture. (3) Corequisite(s): ARCH 6100. This seminar class concentrates on fundamental concepts, issues, and working knowledge specific to design in architecture. It is intended to complement the design problems encountered in ARCH 6100 (studio) and

to serve as a critical platform to raise issues that are not always evident in studio making alone. Primary topics addressed include order, form and space, site, type, and architectural meaning.

ARCH 6602. Representation I: Fundamentals. (3)

Prerequisite(s): ARCH 6100. Corequisite(s): ARCH 6101 or permission of instructor. A fundamental visual and architectural skills course that includes lessons in: visual composition, 2D design and communication, 3D physical models, graphic and photographic image manipulation, and craft in design. Also includes readings and criticism, which address the artistic and architectural correlation of these skills.

ARCH 6603. Representation II: Digital Fundamentals. (3)

Prerequisite(s): ARCH 6602. Corequisite(s): ARCH 6102. Introduces students to architectural drafting (2D) and modeling (3D) using digital tools and processes. The expected outcome of this course is a student who is skillful, adaptable, and critical in the use of digital media.

ARCH 6890. Directed Independent Study. (1 to 6)

Prerequisite(s): Permission of the Associate Director and faculty member advising the study. Enables directed individual study and in-depth analysis of a special area related to the interests of the student and the expertise of the advising faculty member. May count towards completion of Concentration requirements if appropriate. *May be repeated for credit with change of topic. May enroll in duplicates in the same semester.*

ARCH 7101. Design Studio Topics. (6) Focuses on issues relevant to current architectural practice and/or exploration of architectural theory. Students choose from among several sections of this studio, each of which addresses a different set of issues. The issues addressed as well as the pedagogical approach of these studios are defined by the faculty teaching them.

ARCH 7102. Design Studio Topics. (6) Prerequisite(s): ARCH 7101. Focuses on issues relevant to current architectural practice and/or exploration of architectural theory. Students choose from among several sections of this studio, each of which addresses a different set of issues. The issues addressed as well as the pedagogical approach of these studios are defined by the faculty teaching them. All students must take a minimum of one Design Studio Topics. *May not be repeated for credit.*

ARCH 7103. Design Studio Integrated Project. (6)

Prerequisite(s): Graduate standing and enrollment in Architecture program. Corequisite(s): ARCH 5305. Focuses on a site-specific project emphasizing technological and systemic issues that lead towards a comprehensive building design. This necessitates an integrative process, examining the intersection of project circumstances,

formal/spatial interpretations, conceptual thinking, systemic materiality and technology, tectonic clarity, and performative strategies for architecture. *May not be repeated for credit.*

ARCH 7104. Design Studio Diploma Project. (6)

Prerequisite(s): ARCH 7103. This concluding design studio for the M.Arch. is the capstone project experience for the professional degree. Students engage an instructor-led studio theme that involves design, research, and/or practical issues relevant to architecture and its discourse.

ARCH 7201. Research and Design Methods (3) Evaluation of varying research and design methods commonly used in contemporary architectural practice. Students are challenged to explore their design biases, to hone their own toolkit of methodologies, and to articulate their own perspective on matters of design - its purpose, meaning, methods, and potential.

ARCH 7211. Research Lab I. (4 to 6) The Research Lab course is typically project-based and organized around research questions and topics chosen by the participating faculty. The Research Lab may be jointly taught by faculty from the School of Architecture and other collaborating departments from the University. *May be repeated for credit.*

ARCH 7212. Studio Lab II. (4 to 6) The Studio Lab sequence situates students with varying backgrounds in a research environment that allows them to develop and test innovative tools, applications, and solutions. Each semester may be jointly taught by faculty from the School of Architecture and other collaborating departments from the University. The course is typically project-based and organized around research questions and topics chosen by the participating faculty.

ARCH 7500. Architectural COOP: Integrated Path to Architectural Licensure (iPAL). (0) Prerequisite(s): Enrollment in the iPAL Program. This course is an intensive sixteen-month experience that offers students enrolled in the Integrated Path to Architectural Licensure Program (iPAL) placement in a professional architectural office in order to accrue Architectural Experience Program (AXP) credits to sit for the Architectural Registration Examination (ARE) as part of their architectural license process prior to graduation from an accredited academic program. This required experience should be taken in the year prior to their final year in the academic program. The course is overseen by faculty and professional office advisors, and operates under cooperative education requirements of the University Career Center. *Graded on a Pass/Unsatisfactory basis. May be repeated.*

ARCH 7800. Thesis Prep. (3) This course is taken in the semester before thesis and serves as a guided

independent research seminar under the direction of a thesis advisor. Students conduct literature reviews, test ideas, and prepare for their thesis.

ARCH 7900. Thesis. (6) The Thesis is the culmination of the student's work in the MS Program. It allows students to pursue focused research based upon their previous experiences and coursework. The intent is to demonstrate an understanding of an ongoing discourse, to form a clear hypothesis, and to develop research methods suitable to implement and test the hypothesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

ARCH 7950. Directed Research Study. (3) Prerequisite(s): completion of first year of the M.Arch. II Program (or equal). An optional opportunity for research in which M.Arch. II students may engage. Allows graduate students to engage research activities to support their growing knowledge of architecture and architectural discourse. Informs and motivates possible interests that the students might pursue in their final year of study.

ARCH 8004. Architectural History Topics. (3) Cross-listed Course(s): ARCH 5204. Prerequisite(s): Graduate standing. Topics are available in a wide variety of subjects in architectural history and theory, in which students develop in-depth research, writing, and presentation skills. *May be repeated for credit with change of topic.*

ARCH 8050. Architectural Elective: Connective Environments I. (3) Cross-listed Course(s): ARCH 6050. Topics include: Computation, Theory, Representation, Making, Urbanism, and Technology. *May be repeated for credit with change of topic.*

ARCH 8211. Studio Lab. (4) A studio approach to teaching topics in interaction design. Aspects of interaction design taught in the studio may include: gesture-based interaction, tangible interaction, large public display interaction, tabletop interaction, multi-touch tablet interaction, and human-robot interaction. *May be repeated with permission of Graduate Program Director.*

ARCH 8607. Digital Manufacturing and Robotics. (3) Cross-listed Course(s): ARCH 5607. The use of digital manufacturing and robotics is quickly becoming an engrained part of design professions. The understanding of how these machines function will become an essential component of an Architect's understanding of how buildings can be manufactured both in-situ and in a factory. *May be repeated for credit with permission of Graduate Program Director.*

Art Education (ARTE)

ARTE 5121. Teaching Art to Elementary Students. (3)

Prerequisite(s): Admission into Graduate Certificate in Teaching Art Education. Analysis of learning themes as related to growth and development in the visual arts; organization of tools, media and materials appropriate for the elementary level; curriculum design in planning art units and lessons, evaluation and motivation techniques. A practicum of minimum 20 hours in an elementary setting is required where the student assists the teacher, tutors students, and practices teaching a minimum of two times.

ARTE 5122. Teaching Art to Secondary Students. (3)

Prerequisite(s): Admission into Graduate Certificate in Teaching Art Education. Analysis of learning themes as related to growth and development in the visual arts; organization of tools, media and materials appropriate for the middle/secondary level; curriculum design in planning art units and lessons, assessment, classroom management and motivation techniques. A practicum of minimum 20 hours in a secondary setting is required where the student assists the teacher, tutor students, and practices teaching a minimum of two times.

Athletic Training (ATRN)

ATRN 6100. Acute and Emergency Care in Athletic Healthcare. (3)

Prerequisite(s): Admission to MSAT program and current certification in either American Red Cross Professional Rescuer CPR or American Heart Association Basic Life Support for Healthcare Providers. A comprehensive approach to acute and emergency care in athletic healthcare through lecture and laboratory activities in identification of risk factors, preparation of emergency plans, and recognition of emergency medical conditions.

ATRN 6101. Clinical Anatomy for Allied Health. (3)

Prerequisite(s): Admission to MSAT program. An advanced examination of musculoskeletal anatomy and how it relates to function of the human body.

ATRN 6102. Fundamentals in Athletic Training. (3)

Prerequisite(s): Admission to MSAT program. An overview of athletic training, including basic components of the athletic training profession. Topics include: taping procedures, appropriate terminology, and documentation and communication methods.

ATRN 6103. Introduction to Clinical Care. (1)

Prerequisite(s): Admission to MSAT program. Performance of basic athletic training skills. Students develop competence in introductory athletic training skills.

ATRN 6104. Clinical Evaluation and Diagnosis of the Lower Extremity. (3) Prerequisite(s): ATRN 6101 and ATRN 6102. A comprehensive approach to the assessment and diagnosis of lower extremity musculoskeletal injuries, including the identification of risk factors, the role of clinical outcome measures, and appropriate referral decisions.

ATRN 6105. Therapeutic Modalities. (3) Prerequisite(s): ATRN 6101 and ATRN 6102. Provides both theoretical and clinical bases for the use of therapeutic modalities and pharmacology in the rehabilitation setting. Topics include: basic physics, physiological effects, indications, contraindications, and applications of therapeutic modalities in rehabilitation.

ATRN 6106. Therapeutic Exercise Techniques. (3) Prerequisite(s): ATRN 6101 and ATRN 6102. Study of the theory and principles that guide the application of therapeutic exercise. Emphasis is placed on understanding the tissue healing response, and the basic elements of a rehabilitation program.

ATRN 6107. Foundations of Modern Healthcare. (3) Develops essential skills for evidence-based practitioners in healthcare. Students learn how to generate clinical questions; interpret access, evaluate, and integrate relevant research literature. Students also use their own clinical experiences with patient-orientated outcomes measures along with research to make clinical decisions.

ATRN 6109. Clinical Evaluation and Diagnosis of the Upper Extremity. (3) Prerequisite(s): ATRN 6104. A comprehensive approach to the assessment and diagnosis of upper extremity musculoskeletal injuries, including the identification of risk factors, the role of clinical outcome measures, and appropriate referral decisions.

ATRN 6110. Clinical Evaluation and Diagnosis of the Head and Spine. (3) Prerequisite(s): ATRN 6104. A comprehensive approach to the assessment and diagnosis of upper extremity musculoskeletal injuries, including the identification of risk factors, the role of clinical outcome measures, and appropriate referral decisions.

ATRN 6111. Therapeutic Interventions. (3) Prerequisite(s): ATRN 6104 and ATRN 6106. Corequisite(s): ATRN 6113. Application of rehabilitation techniques and modalities to upper and lower extremity injuries.

ATRN 6113. Patient-Centered Healthcare. (3) Corequisite(s): ATRN 6111. Incorporating an individual's health needs and desired health outcomes in clinical decisions.

ATRN 6114. General Medicine and Pharmacology I. (3) Prerequisite(s): ATRN 5105 or ATRN 6105. The first part of students learning how to evaluate, diagnose, and treat common non-orthopedic medical conditions.

ATRN 6118. Administration for Healthcare Professionals. (3) Prerequisite(s): ATRN 6113. Focuses on business management principles associated with healthcare administration, as well as leadership and professional development.

ATRN 6119. General Medicine and Diagnostic Procedures. (3) Prerequisite(s): ATRN 6114. The second part of learning how to evaluate, diagnose, and treat common non-orthopedic medical conditions. Students continue learning the medications used to treat the non-orthopedic medical conditions. Additionally, students identify and describe various modes of imaging techniques and tests used in sports medicine. Diagnostic procedures covered in the course include, but are not limited to: X-ray, CT scan, MRI, bone scan, fluoroscopy, and PET.

ATRN 6121. Behavioral Health in Sports Medicine. (3) Prerequisite(s): ATRN 6118. Integrates physiological, psychological, and social understanding of humans in relationship to physical activity as a lifelong pursuit. Topics include: physical fitness, nutrition, stress reduction, socialization, and individual differences in human behavior.

ATRN 6401. Pediatric Sports Medicine Clinical Rotation. (1) Prerequisite(s): ATRN 6101 and ATRN 6102. A semester long clinical rotation that focuses on the health care needs of pediatric/adolescent athletes. Students will focus on the practice of acute management skills, as part of an inter-professional sports medicine team providing care to high school and/or middle school athletes.

ATRN 6402. Collegiate Sports Medicine Clinical Rotation (1) Prerequisite(s): ATRN 6401. Students will participate in an inter-professional sports medicine team providing care to primarily collegiate athletes. Emphasis is placed on assessment of injuries, rehabilitation techniques, and modalities use. Students spend approximately 10-15 hours per week at their clinical site.

ATRN 6403. Orthopedic Sports Medicine Clinical Rotation. (1) Prerequisite(s): ATRN 6402. Students will participate in an inter-professional health care team focused on orthopedic assessment with patients across the lifespan. Students spend approximately 10-15 hours per week at their clinical site.

ATRN 6405. Career Focused Clinical Rotation. (3) Prerequisite(s): ATRN 6403. A semester-long clinical rotation that focuses on synthesis and the integration of knowledge, skills, and clinical decision-making into patient care under the supervision of a clinical instructor at various sites. Clinical site selection is based on the future goals and needs of the student. The rotation allows students to participate in the full scope of athletic training clinical practice as part of an inter-professional sports medicine

team. Students spend approximately 20-25 hours per week at their clinical site.

ATRN 6406. Immersive Clinical Rotation. (6) Prerequisite(s): ATRN 6405. A semester-long, full-time, clinical immersion rotation that provides the athletic training student the opportunity to gain experience in a specific area of clinical practice that they are interested in pursuing post-graduation. This rotation allows students to participate in the full scope of athletic training clinical practice as part of an inter-professional sports medicine team. Students will gain 30-40 hours of clinical field experience per week (minimum of 480 hours required).

Business Administration DBA (BDBA)

BDBA 8100. Introduction to Experimental Design and Measurement. (3) Overview of quasi-experimental design, qualitative techniques, basic statistics, and methodological skills necessary to carry out applied research in the fields of management, marketing, operations management and information systems.

BDBA 8110. Organizational Theories and Systems. (3) Review of a broad range of organizational theory and topics in the fields of management, marketing, operations management and information systems.

BDBA 8120. Professional Issues I. (3) Introduction to the principles of scholarly research for both academic and industry settings, including ethics and research integrity, navigating scholarly literature, focusing on research and teaching excellence.

BDBA 8130. Introduction to Business Theory. (3) Review of fundamental theories and research in the fields of strategic management, marketing, operations management, and information systems.

BDBA 8140. Advanced Business Theory. (3) Review of micro- and meso-theories and research developed in the fields of management, marketing, operations management and information systems.

BDBA 8150. Business Statistics and Data Analysis. (3) Development of basic skills to conduct quantitative and qualitative research in the chosen area of study within the fields of management, marketing, operations management and information systems.

BDBA 8200. Research Methods I. (3) Development and application of advanced research skills. Both advanced

quantitative and qualitative research methods are discussed.

BDBA 8210. Current Topics Research Seminar. (3) Review of current topics in the fields of management, marketing, operations management and information systems and development of research skills in the respective focus areas.

BDBA 8220. Professional Issues II. (3) Consideration of advanced topics in the conduct and application of scholarly research within both academic and industry settings.

BDBA 8230. Research Methods II. (3) Development and application of advanced research skills necessary for successfully defending a dissertation proposal, building on Research Methods I. Both advanced quantitative and qualitative research methods are discussed.

BDBA 8240. Focused Research Seminar. (3) Review of current topics identified by the students in the program to support the development of dissertation idea. Topics include: the fields of management, marketing, operations management, and information systems.

BDBA 8350. Dissertation Proposal Development. (3) In-depth discussion of papers and development of research models and approaches in preparation of dissertation work. Collaboration with the intended dissertation chair is desired.

BDBA 8999. Doctoral Dissertation Research. (1 to 9) Each student initiates and conducts an individual investigation culminating in the preparation and presentation of a doctoral dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Bioinformatics (BINF)

BINF 5171. Business of Biotechnology. (3) Prerequisite(s): Admission to a graduate program. Introduces students to the field of biotechnology and how biotech businesses are created and managed. Students should be able to define biotechnology and understand the difference between a biotech company and a pharmaceutical company. Additional concepts covered will include platform technology, biotechnology's history, biotechnology products and development processes, current technologies used by biotech companies today, biotechnology business fundamentals, research and development within biotech companies, exit strategies, and careers in the biotech field.

BINF 5191. Life Sciences and the Law. (3) Prerequisite(s): Admission to a graduate program. Law and regulations permeate our daily lives, and nowhere is this truer than in areas of life sciences. This course explores what the law is, how our current laws developed, and factors currently affecting the evolution of the law. It provides a general overview of U.S. law, including constitutional law, criminal law, contract law, tort law, property law (especially intellectual property law), business law (especially legal aspects of forming a new company), and administrative law. It then focuses on specific aspects of the law affecting the life sciences, such as ownership of tissues and organisms, regulation of drugs and medical devices, regulation of research in the life sciences, the history and regulation of medicine, the economics and various types of health care delivery, and food production.

BINF 6010. Topics in Bioinformatics. (3) Prerequisite(s): permission of the department. Topics in bioinformatics and genomics selected to supplement the regular course offerings. A student may register for multiple sections of the course with different topics in the same semester or in different semesters.

BINF 6100. Biological Basis of Bioinformatics. (3) Prerequisite(s): Admission to graduate standing in Bioinformatics and undergraduate training in Computer Science or other non-biological discipline. Cross-listed Course(s): BINF 8100. Provides a foundation in the fundamental processes involved in molecular biology including transmission genetics, molecular genetics and cell biology focusing on topics essential for understanding the biological aspects of genomics and computational biology. Students will learn genetic mapping, inheritance patterns, DNA structure and packaging, mechanisms of replication and repair, the central dogma of molecular genetics, regulation of gene expression and basic cellular biology. This course is designed for students without a biological background.

BINF 6101. Energy and Interaction in Biological Modeling. (3) Prerequisite(s): Admission to graduate standing in Bioinformatics. This course covers: (a) the major organic and inorganic chemical features of biological macromolecules; (b) the physical forces that shape biological molecules, assemblies and cells; (c) the chemical driving forces that govern living systems; (d) the molecular roles of biological macromolecules and common metabolites; (e) and the pathways of energy generation and storage. Each section of the course builds upon the relevant principles in biology and chemistry to explain the most common mathematical and physical abstractions used in modeling in the relevant context.

BINF 6111. Bioinformatics Programming I. (3) Prerequisite(s): Admission to graduate standing or consent of instructor. Pre- or Co-requisite(s): BINF 6115. Cross-listed Course(s):

BINF 8111. Introduction to computational thinking and problem-solving using a high-level programming language in a Bioinformatics context. It will teach concepts such as variables, data types, control structures, functions, and file input and /output. This course is designed to teach programming fundamentals to Bioinformatics students without a computational background.

BINF 6112. Bioinformatics Programming II. (3) Prerequisite(s): BINF 6111 or permission of instructor. Cross-listed Course(s): BINF 8112. Programming II is a continuation of Programming I (BINF-6111/BINF-8111). In Programming II, students shall practice, refine, and gain advanced skills on basic concepts learned in Programming I. New topics include: writing maintainable and reusable code; advanced Python concepts and tools, Python modules for data analysis in the context of bioinformatics, and object-oriented programming (OOP).

BINF 6115. Introduction to UNIX Computing for Bioinformatics. (1) Prerequisite(s): Permission of department. A foundation of commonly used UNIX commands and functions for all Bioinformatics courses. Bash shell scripting is introduced. The concept of analysis pipelines is introduced using universal UNIX commands. Reproducibility of analysis and adherence to the FAIR (Findability, Accessibility, Interoperability, and Reuse of digital assets) principles in scientific computing is also introduced.

BINF 6151. Professional Communication. (1) Cross-listed Course(s): GRAD 6151. Principles and useful techniques for effective oral presentations, poster presentations, scientific writing, use of references and avoiding plagiarism. Students in the course critique and help revise each other's presentations and learn how to avoid common pitfalls. In addition, students learn how to properly organize and run a meeting.

BINF 6152. Program and Professional Orientation. (1) Students learn to identify key Bioinformatics skill sets and where they are applied in research and industry settings, join appropriate professional networks, use the major professional and research journals in the field, identify key organizations and companies driving intellectual and technology development in bioinformatics, and achieve beginner-level proficiency with key molecular data repositories.

BINF 6153. Career Development in Bioinformatics. (1) Students prepare intensively for the job search, from developing a resume, to identifying appropriate opportunities, to preparing for the interview. Students are expected to complete a final interview practicum with faculty and members of the PSM Executive Board.

BINF 6200. Statistics for Bioinformatics. (3) Prerequisite(s): Permission of department. Introduces students to statistical methods commonly used in bioinformatics. Basic concepts from probability, stochastic processes, information theory, and other statistical methods are introduced and illustrated by examples from molecular biology, genomics and population genetics with an outline of algorithms and software. R is introduced as the programming language for homework.

BINF 6201. Molecular Sequence Analysis. (3) Prerequisite(s): BINF 6100 or equivalent. Corequisite(s): BINF 6115 and BINF 6200, or completion of an undergraduate degree, minor, or concentration in Bioinformatics. Cross-listed Course(s): BINF 8201. Introduction to the basic computational methods, theory, open-source software, and algorithms that are commonly used in molecular sequence analysis. Topics to be covered include types and formats of biological sequence data, the use of common sequence databases, the underlying algorithms for sequence alignment and sequence searching, an introduction to the *de novo* assembly of genomes, and Hidden Markov Model methods used for genome annotation and structural predictions.

BINF 6202. Computational Structural Biology. (3) Prerequisite(s): BINF 6101 and BINF 6201 or their equivalents. Topics include: (a) the fundamental concepts of structural biology (chemical building blocks, structure, superstructure, folding, etc.); (b) structural databases and software for structure visualization; (c) Structure determination and quality assessment; (d) protein structure comparison and the hierarchical nature of biomacromolecular structure classification; (e) protein structure prediction and assessment; and (f) sequence- and structure-based functional site prediction.

BINF 6203. Genomics. (3) Prerequisite(s): BINF 6201 and BINF 6115, or completion of an undergraduate degree, minor or concentration in Bioinformatics. Cross-listed Course(s): BINF 8203. Builds on the methods learned in Molecular Sequence Analysis to show how they are applied to genome-scale problems. Working with datasets from microbial and viral systems, students will learn how sequencing is used to generate reference genome sequences, collect genomic surveillance data, identify and classify genetic variants, explore gene expression and regulation, and discover what makes up microbial communities and how they interact. Emphasis on method benchmarking, real world best practices, and reproducibility of analyses.

BINF 6204. Mathematical Systems Biology. (3) Prerequisite(s): BINF 6200 and BINF 6210 or equivalents. Introduces basic concepts, principles and common methods used in systems biology. Emphasizes molecular networks, models and applications, and covers the

following topics: (a) the structure of molecular networks; (b) network motifs, their system properties and the roles they play in biological processes; complexity and robustness of molecular networks; (c) hierarchy and modularity of molecular interaction networks; kinetic proofreading; (d) optimal gene circuit design; and (e) the rules for gene regulation.

BINF 6205. Computational Molecular Evolution. (3) Prerequisite(s): BINF 6201 and BINF 6200 or permission of the instructor. Cross-listed Course(s): BINF 8205. Covers both the theoretical and practical aspects of performing phylogenetic analyses, with particular emphasis on understanding the differences and applications of the most commonly used methods. Topics to be covered will include: finding the appropriate data and getting it into the right format; using distance-based and probability-based methods to construct phylogenetic trees; understanding and calibrating the molecular clock to calculate divergence times; incorporating "big data" into phylogenetics, and estimating population parameters such as population size, growth, and migration rates.

BINF 6210. Machine Learning for Bioinformatics. (3) Prerequisite(s): BINF 6200 and Calculus. Introduction of commonly used machine learning methods in the field of bioinformatics. Topics include: dimension reduction using principal component analysis, singular value decomposition, and linear discriminant analysis, clustering using k-means, hierarchical, expectation maximization approaches, classification using k-nearest neighbor and support vector machines. To help understand these methods, basic concepts from linear algebra, optimization, and information theory are explained. Application of these machine learning methods to solving bioinformatics problems are illustrated using examples from the literature.

BINF 6211. Design and Implementation of Bioinformatics Databases. (3) Prerequisite(s): Permission of instructor. The fundamentals of database modeling as used in bioinformatics. By the end of the course, students should be able to: understand different types of data models, know how hierarchical and relational models work and give examples that are widely used for biological databases, understand the capabilities of a standard, open source RDBMS, understand the tasks required for data integration and how to use SQL as a research tool. Introduction to ML, XML Schema, and BioOntologies as widely used data exchange and organization tools in bioinformatics databases.

BINF 6305. Computational Population Genetics. (3) Prerequisite(s): BINF 6111, BINF 6200, BINF 6201. Cross-listed Course(s): BINF 8305. Genome sequence variation in nature is shaped by evolutionary forces of mutation, migration, drift, selection, and mating structure. Computational Population Genetics covers evolutionary

theory and models that can explain sequence diversity in nature, as well as computational techniques for genomic analysis. Students will gain hands-on experience with techniques and algorithms for analysis of variation within populations. We will discuss mathematical models and use for emerging bioinformatic tools for evolutionary inference. Course material is designed to provide students with analytical tools and theoretical understanding for careers in computational evolutionary genomics including modern human evolutionary genetics.

BINF 6310. Advanced Statistics for Genomics. (3)

Prerequisite(s): BINF 6200 or equivalent. Cross-listed Course(s): BINF 8310. Students will gain expertise in statistical methods commonly used in bioinformatics and genomics analysis. This course builds upon the prerequisite by establishing students' comprehensive understanding of statistical methods, including underlying theory, assumptions, limitations, and applications across bioinformatics. Students will gain the expertise to choose, implement, analyze, visualize, and report on statistical methods used in academic and professional bioinformatics analysis. Beyond statistical methods, the course builds core skills in ethical statistical practices, professional statistical writing, and critical statistics evaluation. The course includes lectures and coding assignments utilizing real-world data in the R programming language.

BINF 6314. Advanced Bioinformatics Algorithms. (3)

Prerequisite(s): BINF 6200, BINF 6201, or equivalent. Cross-listed Course(s): BINF 8314. Introduces concepts of algorithms and complexity of computational problems, and covers algorithms for dimension reduction, data clustering, DNA motif finding, amino acid substitution matrices, sequence alignments, genome assembly, sequence pattern mapping, reconstruction of ancestor genomes, hidden Markov models, neural networks and deep-learning.

BINF 6350. Biotechnology and Genomics Laboratory. (3)

Prerequisite(s): A background in molecular biology and biochemistry or permission of the instructor. Introduction of the molecular biological methods by which samples are converted to a state from which sequence information can be produced. When sequence data is produced in a highly parallel fashion across a large fraction of a genome it is the basis of genomics. For historical reasons, the sample put on a sequencer is called a library, and the art of genomics lies in library construction. The experimental design and the technical details of library construction significantly affect the analyses that are appropriate and the conclusions that can be made. Lectures cover the design of experiments, how to critically read the literature to select an appropriate protocol for a variety of experimental purposes, and follow it to transform a sample into high quality sequence data. Quality control and library validation methods are explained. Topics

include: selecting applications tuned to the experiment design to ensure proper data analysis and interpretation.

BINF 6380. Advanced Bioinformatics Programming. (3)

Prerequisite(s): BINF 6112 or equivalent or permission of instructor. Advanced algorithms in bioinformatics with an emphasis placed on the implementation of bioinformatics algorithms in the context of parallel processing. Topics covered depend on instructor expertise and student interest, but may include assembly of short read fragments from next-generation sequencing platforms, clustering algorithms, machine learning, development of multi-threaded applications, developing for multi-core processors and utilization of large clusters and "cloud" supercomputers. Students are expected to complete a significant independent project. Course includes hands-on experience with multi-threaded programming.

BINF 6400. Internship Project. (1 to 3) Prerequisite(s):

Admission to graduate standing in Bioinformatics. Project is chosen and completed under the guidance of an industry partner, and results in an acceptable technical report.

BINF 6600. Bioinformatics Seminar. (1) Cross-listed

Course(s): BINF 8600. Prerequisite(s): Admission to graduate standing in Bioinformatics. Weekly seminars are given by bioinformatics researchers from within the University and across the world.

BINF 6601. Bioinformatics Journal Club. (1) Prerequisite(s):

Admission to graduate standing in Bioinformatics. Each week, a student in the course is assigned to choose and present a paper from the primary bioinformatics literature.

BINF 6880. Independent Study. (1 to 3) Faculty supervised research experience to supplement regular course offerings.

BINF 6900. Master's Thesis. (1 to 3) Prerequisite(s): 12 graduate credit hours and permission of instructor. Project is chosen and completed under the guidance of a graduate faculty member, and will result in an acceptable master's thesis and oral defense. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

BINF 8010. Topics in Bioinformatics. (3) Prerequisite(s):

Permission of department. Topics in bioinformatics and genomics selected to supplement the regular course offerings. A student may register for multiple sections of the course with different topics in the same semester or in different semesters.

BINF 8100. Biological Basis of Bioinformatics. (3)

Prerequisite(s): Admission to graduate standing in Bioinformatics and undergraduate training in Computer Science or other non-biological discipline. Cross-listed

Course(s): BINF 6100. Provides a foundation in the fundamental processes involved in molecular biology including transmission genetics, molecular genetics and cell biology focusing on topics essential for understanding the biological aspects of genomics and computational biology. Students will learn genetic mapping, inheritance patterns, DNA structure and packaging, mechanisms of replication and repair, the central dogma of molecular genetics, regulation of gene expression and basic cellular biology. This course is designed for students without a biological background.

BINF 8101. Energy and Interaction in Biological Modeling. (3)

Prerequisite(s): Admission to graduate standing in Bioinformatics. Topics include: the major organic and inorganic chemical features of biological macromolecules; the physical forces that shape biological molecules, assemblies and cells; the chemical driving forces that govern living systems; the molecular roles of biological macromolecules and common metabolites; and the pathways of energy generation and storage. Each section of the course builds upon the relevant principles in biology and chemistry to explain the most common mathematical and physical abstractions used in modeling in the relevant context.

BINF 8111. Bioinformatics Programming I. (3)

Prerequisite(s): Admission to graduate standing in Bioinformatics or permission of instructor. Pre- or Co-requisite(s): BINF 6115. Cross-listed Course(s): BINF 6111. Introduction to computational thinking and problem-solving using a high-level programming language in a Bioinformatics context. It will teach concepts such as variables, data types, control structures, functions, and file input and /output. This course is designed to teach programming fundamentals to Bioinformatics students without a computational background.

BINF 8112. Bioinformatics Programming II. (3)

Prerequisite(s): BINF 8111 or permission of instructor. Cross-listed Course(s): BINF 6112. Programming II is a continuation of Programming I (BINF-6111/BINF-8111). In Programming II, students shall practice, refine, and gain advanced skills on basic concepts learned in Programming I. New topics include: writing maintainable and reusable code; advanced Python concepts and tools, Python modules for data analysis in the context of bioinformatics, and object-oriented programming (OOP).

BINF 8151. Professional Communications. (1) Cross-listed Course(s): GRAD 6151 and GRAD 8151. Principles and useful techniques for effective oral presentations, poster presentations, scientific writing, use of references and avoiding plagiarism. Students critique and help revise each other's presentations and learn how to avoid common pitfalls. In addition, students learn how to properly organize

and run a meeting. Students prepare a CV, job application letter, and job talk.

BINF 8200. Statistics for Bioinformatics. (3)

Prerequisite(s): Permission of department. Introduction of statistical methods commonly used in bioinformatics. Basic concepts from probability, stochastic processes, information theory, and other statistical methods are introduced and illustrated by examples from molecular biology, genomics and population genetics with an outline of algorithms and software. R is introduced as the programming language for homework.

BINF 8201. Molecular Sequence Analysis. (3)

Prerequisite(s): BINF 8100 or equivalent. Corequisite(s): BINF 6115 and BINF 8200, or completion of an undergraduate degree, minor, or concentration in Bioinformatics. Cross-listed Course(s): BINF 6201. Introduction to the basic computational methods, theory, open-source software, and algorithms that are commonly used in molecular sequence analysis. Topics to be covered include types and formats of biological sequence data, the use of common sequence databases, the underlying algorithms for sequence alignment and sequence searching, an introduction to the *de novo* assembly of genomes, and Hidden Markov Model methods used for genome annotation and structural predictions.

BINF 8202. Computational Structural Biology. (3)

Prerequisite(s): BINF 8101 and BINF 8201, or their equivalents. Topics include: (a) the fundamental concepts of structural biology (chemical building blocks, structure, superstructure, folding, etc.); (b) structural databases and software for structure visualization; (c) Structure determination and quality assessment; (d) protein structure comparison and the hierarchical nature of biomacromolecular structure classification; (e) protein structure prediction and assessment; and (f) sequence- and structure-based functional site prediction.

BINF 8203. Genomics. (3)

Prerequisite(s): BINF 8201 and BINF 6115, or completion of an undergraduate degree, minor or concentration in Bioinformatics. Cross-listed Course(s): BINF 6203. Builds on the methods learned in Molecular Sequence Analysis to show how they are applied to genome-scale problems. Working with datasets from microbial and viral systems, students will learn how sequencing is used to generate reference genome sequences, collect genomic surveillance data, identify and classify genetic variants, explore gene expression and regulation, and discover what makes up microbial communities and how they interact. Emphasis on method benchmarking, real world best practices, and reproducibility of analyses.

BINF 8204. Mathematical Systems Biology. (3)

Prerequisite(s): BINF 8200 and BINF 8210, or equivalents.

Introduces basic concepts, principles and common methods used in systems biology. Emphasizes molecular networks, models and applications, and covers the following topics: the structure of molecular networks; network motifs, their system properties and the roles they play in biological processes; complexity and robustness of molecular networks; hierarchy and modularity of molecular interaction networks; kinetic proofreading; optimal gene circuit design; and the rules for gene regulation.

BINF 8205. Computational Molecular Evolution. (3)

Prerequisite(s): BINF 8200 and BINF 8201, or permission of the instructor. Cross-listed Course(s): BINF 6205.

Theoretical and practical aspects of performing phylogenetic analyses, with particular emphasis on understanding the differences and applications of the most commonly used methods. Topics will include: finding the appropriate data and getting it into the right format; using distance-based and probability-based methods to construct phylogenetic trees; understanding and calibrating the molecular clock to calculate divergence times; incorporating "big data" into phylogenetics, and estimating population parameters such as population size, growth, and migration rates.

BINF 8210. Machine Learning for Bioinformatics. (3)

Prerequisite(s): BINF 8200 and Calculus. Introduces commonly used machine learning methods in the field of bioinformatics. Topics include: dimension reduction using principal component analysis, singular value decomposition, and linear discriminant analysis, clustering using k-means, hierarchical, expectation maximization approaches, classification using k-nearest neighbor and support vector machines. To help understand these methods, basic concepts from linear algebra, optimization, and information theory are explained. Application of these machine learning methods to solving bioinformatics problems are illustrated using examples from the literature.

BINF 8211. Design and Implementation of Bioinformatics Databases. (3)

Prerequisite(s): Permission of instructor. Introduces the fundamentals of database modeling as used in bioinformatics. By the end of the course, students are able to: understand different types of data models, know how hierarchical and relational models work and give examples that are widely used for biological databases, understand the capabilities of a standard, open source RDBMS, understand the tasks required for data integration and how to use SQL as a research tool. Introduction of XML, XML Schema, and BioOntologies as widely used data exchange and organization tools in bioinformatics databases.

BINF 8305. Computational Population Genetics. (3)

Prerequisite(s): BINF 8200, BINF 8201, BINF 8111 or equivalent. Cross-listed Course(s): BINF 6305. Genome

sequence variation in nature is shaped by evolutionary forces of mutation, migration, drift, selection, and mating structure. Computational Population Genetics covers evolutionary theory and models that can explain sequence diversity in nature, as well as computational techniques for genomic analysis. Students will gain hands-on experience with techniques and algorithms for analysis of variation within populations. We will discuss mathematical models and use for emerging bioinformatic tools for evolutionary inference. Course material is designed to provide students with analytical tools and theoretical understanding for careers in computational evolutionary genomics including modern human evolutionary genetics.

BINF 8310. Advanced Statistics for Genomics. (3)

Prerequisite(s): BINF 8200 or equivalent. Cross-listed Course(s): BINF 6310. Students will gain expertise in statistical methods commonly used in bioinformatics and genomics analysis. This course builds upon the prerequisite by establishing students' comprehensive understanding of statistical methods, including underlying theory, assumptions, limitations, and applications across bioinformatics. Students will gain the expertise to choose, implement, analyze, visualize, and report on statistical methods used in academic and professional bioinformatics analysis. Beyond statistical methods, the course builds core skills in ethical statistical practices, professional statistical writing, and critical statistics evaluation. The course includes lectures and coding assignments utilizing real-world data in the R programming language.

BINF 8311. Biophysical Modeling. (3) Cross-listed Course(s): PHYS 6204. Topics include: an overview of mechanical force fields; energy minimization; dynamics simulations (molecular and coarse-grained); Monte-Carlo methods; systematic conformational analysis (grid searches); classical representations of electrostatics (Poisson-Boltzmann, Generalized Born and Coulombic); free energy decomposition schemes; and hybrid quantum/classical (QM/MM) methods.

BINF 8314. Advanced Bioinformatics Algorithms. (3)

Prerequisite(s): BINF 8200, BINF 8201, or equivalent. Cross-listed Course(s): BINF 6314. Introduces concepts of algorithms and complexity of computational problems, and covers algorithms for dimension reduction, data clustering, DNA motif finding, amino acid substitution matrices, sequence alignments, genome assembly, sequence pattern mapping, reconstruction of ancestor genomes, hidden Markov models, neural networks and deep-learning.

BINF 8350. Biotechnology and Genomics Laboratory (3).

Prerequisite(s): A background in molecular biology and biochemistry or permission of instructor. Introduction to the molecular biological methods by which samples are converted to a state from which sequence information

can be produced. When sequence data is produced in a highly parallel fashion across a large fraction of a genome it is the basis of genomics. For historical reasons, the sample put on a sequencer is called a library, and the art of genomics lies in library construction. The experimental design and the technical details of library construction significantly affects the analyses that are appropriate and the conclusions that can be made. Lectures cover the design of experiments, how to critically read the literature to select an appropriate protocol for a variety of experimental purposes, and follow it to transform a sample into high quality sequence data. Quality control and library validation methods are explained. Topics include: selecting applications tuned to the experiment design to ensure proper data analysis and interpretation.

BINF 8380. Advanced Bioinformatics Programming. (3) Prerequisite(s): BINF 8112 or equivalent, or permission of instructor. Advanced algorithms in bioinformatics with an emphasis placed on the implementation of bioinformatics algorithms in the context of parallel processing. Topics covered depend on instructor expertise and student interest, but may include assembly of short read fragments from next-generation sequencing platforms, clustering algorithms, machine learning, development of multi-threaded applications, developing for multi-core processors and utilization of large clusters and "cloud" supercomputers. Students are expected to complete a significant independent project. Course includes hands-on experience with multi-threaded programming.

BINF 8600. Bioinformatics Seminar. (1) Cross-listed Course(s): BINF 6600. Prerequisite(s): Admission to graduate standing in Bioinformatics. Departmental seminar. Weekly seminars will be given by bioinformatics researchers from within the University and across the world. *May be repeated for credit.*

BINF 8601. Bioinformatics Journal Club. (1) Prerequisite(s): Admission to graduate standing in Bioinformatics. Each week, a student in the class is assigned to choose and present a paper from the primary bioinformatics literature.

BINF 8911. Bioinformatics Research Rotation I. (2) Faculty supervised research experience in bioinformatics to supplement regular course offerings.

BINF 8912. Bioinformatics Research Rotation II. (2) Faculty supervised research experience in bioinformatics to supplement regular course offerings.

BINF 8990. Pre-Dissertation Research. (1 to 9) Prerequisite(s): Permission of department. Students conduct research in bioinformatics under the direction of one or more Bioinformatics faculty. A major goal of this course is to prepare the student for the Qualifying Examination. *May be repeated for credit.*

BINF 8991. Doctoral Dissertation Research. (1 to 9) Individual investigation culminating in the preparation and presentation of a doctoral dissertation. A student may register for multiple sections of this course in the same semester or different semesters. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term.*

Biology (BIOL)

BIOL 5000. Advanced Topics in Biology. (1 to 4) Courses in selected topics and advanced studies in biology. Lecture and laboratory hours will vary with the topics taught. *May be repeated for credit with change of topic.*

BIOL 5111. Evolution. (3) Prerequisite(s): BIOL 3166. Theories of evolution and forces, which affect gene frequencies.

BIOL 5121. Advanced Biometry. (4) Prerequisite(s): BIOL 2140 or equivalent, BIOL 3166 or equivalent, and one STAT course. Advanced biostatistics design and analysis of experiments. Three lecture hours and one laboratory period of three hours a week.

BIOL 5144. Advanced Ecology. (4) Energy flow, nutrient cycles, community structure, population growth and regulation. Three lecture hours and one laboratory period of three hours a week.

BIOL 5162. Advanced Biotechnology I. (3) Prerequisite(s): BIOL 3161 or BIOL 3166 with grade of C or above. Problem-based learning approach where students work in teams to develop solution strategies that use biotechnology to solve real-world problems. Three lecture hours per week.

BIOL 5163. Advanced Biotechnology II. (3) Prerequisite(s): BIOL 3161 or BIOL 3166 with grade of C or above and permission of instructor. Students work in teams to implement solution strategies developed in BIOL 5162 that use biotechnology to solve real-world problems. One laboratory period and two lecture hours per week.

BIOL 5167. Medical Genetics. (3) Prerequisite(s): Admission to Graduate School in Biology or permission of instructor. Various applications of genetics to human health, including studies of the inheritance of diseases in families, mapping of disease genes to specific locations on chromosomes, analyses of the molecular mechanisms through which genes cause disease, diagnosis and treatment of genetic disease, and genetic counseling.

BIOL 5168. Recombinant DNA Techniques. (4) Modern molecular biological methods (such as DNA cloning, gel electrophoresis, nucleic acid hybridization, PCR, and DNA

sequencing) data analysis and interpretation. One lecture hour and two laboratory periods of three hours a week.

BIOL 5171. Cell Physiology. (3) The fundamental physicochemical properties of cells.

BIOL 5184. Plant Biotechnology. (3) A laboratory-oriented course designed to integrate plant molecular biology, recombinant DNA technology, and plant cell and tissue culture. One lecture hour and two laboratory periods of three hours a week.

BIOL 5189. Mechanisms in Development. (3) Cellular and molecular bases of differentiation; an exploration of the experimental analysis of causal and controlling factors in development.

BIOL 5199. Molecular Biology. (3) Structural and functional interaction of nucleic acids and proteins in the replication, transcription and translation of genetic material.

BIOL 5205. Advanced Horticulture. (3) Topics in ornamental horticulture and landscaping, including greenhouse projects and field trips. Two lecture hours and three hours of lab a week.

BIOL 5221. Plant Systematics. (4) Identification and classification of vascular plants, including experimental concepts of speciation. Three lecture hours and one laboratory period of three hours a week.

BIOL 5229. Dendrology. (4) The identification, structure, function, ecology, reproduction, and evolutionary relationships of woody plants. Three lecture hours and one three-hour lab a week.

BIOL 5233. Parasitology. (3) Prerequisite(s): BIOL 2130. Morphology, life cycles, ecology, taxonomy, and medical and economic importance of parasites. Three lecture hours a week.

BIOL 5234. Wildlife Biology. (3) Concepts, principles and techniques of wildlife biology. Identification and life histories with emphasis on the value, study attraction, management, conservation and control of wildlife species.

BIOL 5235. Mammalogy. (4) Prerequisite(s): BIOL 3111. Taxonomy, anatomy, physiology and life histories of the mammals. Three lecture hours and one laboratory period of three hours a week.

BIOL 5242. The Biology of Birds. (3) Prerequisite(s): BIOL 3144 or permission of department. Overview of general avian biology, including taxonomy and anatomy, but concentrating on behavior, ecology and conservation of birds. Focus is on birds of the southeastern U.S.

BIOL 5242L. The Biology of Birds Lab. (1) Meets for one three-hour period per week. The laboratory and field portion of the Biology of Birds focus on field identification and inventory techniques, with an introduction to anatomy. Students will need binoculars.

BIOL 5243. Animal Behavior. (3) An ethological approach to how animals respond to their environment. Causation, development and adaptive significance of behavior in social systems.

BIOL 5244. Conservation Biology. (3) Conservation values, extinction rates, genetic diversity, demography, habitat fragmentation, reserve management, ecological restoration.

BIOL 5250. Microbiology. (3) Morphology, physiology, pathogenicity, metabolism and ecology of micro-organisms.

BIOL 5250L. Microbiology Laboratory. (1) Pre- or Corequisite(s): BIOL 5250. One laboratory period of three hours a week.

BIOL 5251. Immunology. (3) Cellular, molecular, and genetic basis for immunity; physical chemistry of antigens and antibodies and their interactions; defense mechanisms.

BIOL 5251L. Immunology Laboratory. (1) Pre- or Corequisite(s): BIOL 5251. One laboratory period of three hours a week.

BIOL 5253. Marine Microbiology. (4) Bacteria, fungi and viruses of marine origin, and their response to the salt, temperature, pressure and nutrient environment of the ocean. Roles of marine microorganisms in public health, pollution and fouling. Three lecture hours and one laboratory period of three hours a week.

BIOL 5254. Epidemiology. (3) History and practices of epidemiology with emphasis on modes of transmission of clinically important infectious agents and the analysis of epidemiological data. Three lecture hours a week.

BIOL 5255. Bacterial Genetics. (3) Regulation of gene expression in bacterial systems. Bacteriophage genetics. DNA transfer in bacteria.

BIOL 5256. Pathogenic Bacteriology. (3) Cellular and molecular interactions of mammalian hosts with procaryotic parasites.

BIOL 5256L. Pathogenic Bacteriology Laboratory. (1) One laboratory period of three hours a week.

BIOL 5257. Microbial Physiology and Metabolism. (3) Bacterial cell growth and division, transport mechanisms,

catabolism and energy production, biosynthesis of cellular components, global regulation of gene expression in response to the environment, and cell-cell communication between bacteria.

BIOL 5258. Epidemics and Plagues. (3) Prerequisite(s): Admission to the Ph.D. or Master's in Biology program or permission of instructor. A study of the history, modeling, epidemiology, environmental, and behavioral changes that contributed to the development of selected epidemics and plagues which have dramatically affected plants, agricultural animals, and humans.

BIOL 5259. Advanced Virology. (3) Prerequisite(s): BIOL 3166, BIOL 4199, or BIOL 4250 with a grade of C or above. Focus on molecular biology, evolution, and pathogenesis of clinically relevant human and animal viruses. Additional topics include: advances in virus-based gene therapy, vaccines and anticancer agents; viruses as potential bioterrorism threats; bacteriophages and plant viruses; unusual virus-like agents.

BIOL 5259L. Advanced Virology Laboratory. (1) Pre- or Corequisite(s): BIOL 5259. One laboratory period of three hours per week.

BIOL 5260. Population Genetics (3) The genetics of qualitative and quantitative traits in populations, including an assessment of the factors affecting the extent and pattern of the genetic variation in these traits.

BIOL 5261. Genome Stability and Human Disease. (3) Cross-listed Course(s): BIOL 4261. DNA damage arises from environmental and endogenous insults, and a variety of specialized cellular mechanisms enable the efficient and accurate repair of lesions. When repair processes are impaired, substantial developmental defects and predisposition to cancer may result. This course introduces students to the principal DNA repair pathways and the diseases induced by inherited repair defects, with an emphasis on interpreting primary research. The aim of this course is to build on students' basic knowledge of biological principles to provide in-depth knowledge regarding the relationship between DNA repair dysfunction and genetic diseases, including certain cancers.

BIOL 5265. Drugs: Molecular and Cellular Mechanisms. (3) Prerequisite(s): Admission to the Ph.D. or Master's in Biology program or permission of instructor. A detailed focus on representative drugs and their target cells and organs to understand mechanisms of action at a molecular and cellular level. Drug discovery, approval, and economics are also discussed.

BIOL 5277. Endocrinology. (3) Endocrine glands and their physiological roles in metabolism, growth and reproduction.

BIOL 5279. Neurobiology. (3) Prerequisite(s): Biology graduate student or permission from instructor. The molecular and cellular processes of neuronal function in the human central and peripheral nervous systems.

BIOL 5282. Developmental Plant Anatomy. (3) Study of plant cells, tissues, organs and patterns of growth and differentiation.

BIOL 5282L. Developmental Plant Anatomy Laboratory. (1) Pre- or Corequisite(s): BIOL 5282. One laboratory period of three hours a week.

BIOL 5283. Developmental Biology. (3) Cross-listed Course(s): BIOL 4283. Developmental processes occurring chiefly during gametogenesis, fertilization, early embryogenesis, and organogenesis.

BIOL 5283L. Developmental Biology Laboratory. (1) Pre- or Corequisite(s): BIOL 5283. One laboratory period of three hours a week.

BIOL 5284. Eukaryotic Microbiology. (4) Cross-listed Course(s): BIOL 4284. Prerequisite(s): Admission to graduate Biology program or permission of instructor. The biology of free-living, parasitic, and pathogenic eukaryotic microorganisms with emphasis on systematics, cell physiology, ecology, and molecular biology of species contributing to global environmental cycles, animal and crop disease, death, and economic loss. Three hours of lecture and one three hour laboratory period per week.

BIOL 5292. Advances in Immunology. (3) Current topics in immunology with particular emphasis upon the genetic systems and molecular mechanisms underlying immune reactions.

BIOL 5293. Comparative Vertebrate Anatomy. (4) Prerequisite(s): BIOL 2111. Comparative studies of the anatomy, physiology and functional adaptations of selected vertebrates with emphasis on evolutionary developments, especially in mammals. Three lecture hours and one laboratory period of three hours a week.

BIOL 6000. Special Topics in Biology. (1 to 4) Prerequisite(s): Permission of department. Courses in selected topics and advanced studies in biology. Lecture and laboratory hours will vary with the courses taught. *May be repeated for credit.*

BIOL 6010. Special Topics in Microbiology. (1 to 4) Prerequisite(s): Permission of department. Advanced courses in microbiology. *May be repeated for credit with*

change of topic. Lecture and laboratory hours will vary with the courses taught. *May be repeated for credit.*

BIOL 6101. Hypothesis Testing. (3) Prerequisite(s): Admission to the M.S. in Biology program or permission of department. Design and analysis of biological experiments and critical analysis of experimental design in pertinent biological literature.

BIOL 6102. Cell and Molecular Biology. (3) Structure of cellular components; the cell cycle; regulation of transcription, translation, and protein trafficking; cell membranes and transport; cell-cell communication, including signal transduction; extracellular matrix.

BIOL 6103. Immunology of Infection. (4) Prerequisite(s): BIOL 6102 and CHEM 6101, or permission of instructor. The interaction between the host immune system and microorganisms or viruses explored at the genetic and physiological levels with emphases on the process of infection; intracellular invasion and survival/replication; its modulation by resident microbiota and the host's innate and adaptive immune responses; the utility of pathogenic agents for the exploration of host resistance and immunity. Thirty two-hour lectures.

BIOL 6104. Integrative Systems Physiology. (4) Prerequisite(s): CHEM 6101, BIOL 6102, BIOL 6103, or permission of instructor. The functioning of an intact mammalian organism with an emphasis on human physiology. Traditional survey of organ systems' functions, and problems of the response of cells within tissues to stress and their impact on organismal response. Thirty two-hour lectures.

BIOL 6140. Evolutionary Biology. (3) Prerequisite(s): Admission to the M.S. in Biology program or permission of department. Fundamental evolutionary forces of mutation, genetic drift, natural selection, and gene flow; mechanisms generating biological diversity in molecules, genomes, and populations; relationship of micro-evolutionary change and macro-evolutionary patterns.

BIOL 6241. Environmental Biology. (3) Prerequisite(s): Admission to the M.S. in Biology program or permission of department. An overview of ecological principles as they apply to relationships and interactions between organisms and their environment, with investigation of current research topics and issues related to impacts of human activities on environmental processes.

BIOL 6260. Careers in Bioscience: Professional Development and Responsible Conduct. (2) Prerequisite(s): Admission to M.S. in Biology program or permission of department. Professional development for Master's students. The focus is on teaching toward the Broadening Experiences in Scientific Training (BEST) initiative and the

Responsible Conduct of Research (RCR) directive. Hybrid course composed of class meetings and MOODLE tasks.

BIOL 6270. Biological Pathways and Metabolism. (3) Prerequisite(s): Admission to the M.S. in Biology program or permission of department. An overview of biological pathways and metabolism principles as they apply to cell biology, relationships and interactions between cell and/or organisms and their environment, with investigation of current research topics.

BIOL 6273. Advanced Human Physiology. (3) Prerequisite(s): Admission to MSN program. Advanced course in human physiology stressing the interaction between physiological systems.

BIOL 6274. Advanced Human Pathophysiology. (3) Prerequisite(s): Admission to MSN program. Advanced course in human pathophysiology stressing the loss of normal function interaction in physiological systems.

BIOL 6366. Advanced Protein Biotechnology. (3) Cross-listed Course(s): BIOL 8366. Prerequisite(s): BIOL 6270 or BIOL 8270. The study of proteins is important in most modern molecular biology laboratories. In this course, students learn the principles behind a range of commonly used molecular biology techniques and how to optimize them. Also included are state-of-the-art methodologies such as CRISPR-CAS9 and mass spectrometry. By the end of the course, students are able to design and optimize complex protein-based experiments. All students interested in cell/molecular biology, biotechnology, and cancer biology are encouraged to participate.

BIOL 6400. Internship Project. (1 to 3) Prerequisite(s): Admission to Biology graduate program. An individualized mentored internship or project chosen and completed under the guidance of an industry or external partner. The internship is part of the approved plan of study for experiential learning by registered graduate students. Results from the internships are reported in an acceptable report. *May be repeated for credit with approval.*

BIOL 6600. Seminar. (1 to 2) Topics of current emphasis in biology. *May be repeated for credit.*

BIOL 6800. Tutorial. (1 to 4) Directed study in areas of specialization in biology and related fields. Maximum credit toward degree: four hours. *Graded on a Pass/Unsatisfactory or IP basis.*

BIOL 6900. Research and Thesis. (1 to 8) Laboratory research for the thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

BIOL 6901. Laboratory Research. (1 to 3) Directed laboratory research in areas of specialization in biology and related fields. Maximum credit toward non-thesis Master's degree = two hours. Maximum credit toward Biotechnology Graduate Certificate = 3 hours. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit up to 3 credit hours.*

BIOL 8000. Special Topics in Biology. (1 to 4)
Prerequisite(s): Permission of department. Courses in selected topics and advanced studies in biology. Lecture and laboratory hours vary with the courses taught. *May be repeated for credit.*

BIOL 8010. Special Topics in Microbiology. (1 to 4)
Prerequisite(s): Permission of department. Advanced courses in microbiology. *May be repeated for credit with change of topic.* Lecture and laboratory hours vary with the courses taught. *May be repeated for credit.*

BIOL 8101. Hypothesis Testing. (3) Prerequisite(s): Admission to the Ph.D. in Biology program or permission of department. Design and analysis of biological experiments and critical analysis of experimental design in pertinent biological literature.

BIOL 8102. Cell and Molecular Biology. (3) Prerequisite(s): Admission to Ph.D. in Biology program or permission of department. Structure of cellular components; the cell cycle; regulation of transcription, translation, and protein trafficking; cell membranes and transport; cell-cell communication, including signal transduction; extracellular matrix.

BIOL 8103. Immunology of Infection. (4) Prerequisite(s): BIOL 8101 and CHEM 8101, or permission of instructor. The interaction between the host immune system and microorganisms or viruses explored at the genetic and physiological levels with emphases on the process of infection; intracellular invasion and survival/replication; its modulation by resident microbiota and the host's innate and adaptive immune responses; the utility of pathogenic agents for the exploration of host resistance and immunity. Thirty two-hour lectures.

BIOL 8104. Integrative Systems Physiology. (4)
Prerequisite(s): BIOL 8102, BIOL 8103, CHEM 8101, or permission of instructor. The functioning of an intact mammalian organism with an emphasis on human physiology. Traditional survey of organ systems' functions, and problems of the response of cells within tissues to stress and their impact on organismal response.

BIOL 8140. Evolutionary Biology. (3) Prerequisite(s): Admission to the Ph.D. in Biology program or permission of department. Fundamental evolutionary forces of mutation, genetic drift, natural selection, and gene flow;

mechanisms generating biological diversity in molecules, genomes, and populations; relationship of micro-evolutionary change and macro-evolutionary patterns.

BIOL 8200. Interdisciplinary Colloquium. (1) Prerequisite(s): Admission to the Ph.D. in Biology program. Discussion and analysis of topics of current emphasis in biomedicine and biotechnology. *May be repeated for credit.*

BIOL 8201. Seminar. (1) Prerequisite(s): Admission to the Interdisciplinary Ph.D. in Biology program. Formal student presentations of current literature topics. *May be repeated for credit.*

BIOL 8241. Environmental Biology. (3) Prerequisite(s): Admission to the Ph.D. in Biology program or permission of department. An overview of ecological principles as they apply to relationships and interactions between organisms and their environment, with investigation of current research topics and issues related to impacts of human activities on environmental processes.

BIOL 8260. Careers in Bioscience: Professional Development and Responsible Conduct. (2) Prerequisite(s): Admission to the Ph.D. in Biology program or permission of department. Professional development for Ph.D. students and post-doctoral fellows. The focus is on teaching toward the Broadening Experiences in Scientific Training (BEST) initiative and the Responsible Conduct of Research (RCR) directive. Hybrid course composed of class meetings and MOODLE tasks.

BIOL 8270. Biological Pathways and Metabolism. (3)
Prerequisite(s): Admission to Ph.D. in Biology program or permission of department. An overview of biological pathways and metabolism principles as they apply to cell biology, relationships and interactions between cell and/or organisms and their environment, with investigation of current research topics.

BIOL 8366. Advanced Protein Biotechnology. (3) Cross-listed Course(s): BIOL 6366. Prerequisite(s): BIOL 6270 or BIOL 8270. The study of proteins is important in most modern molecular biology laboratories. In this course, students learn the principles behind a range of commonly used molecular biology techniques and how to optimize them. Also included are state-of-the-art methodologies such as CRISPR-CAS9 and mass spectrometry. By the end of the course, students are able to design and optimize complex protein-based experiments. All students interested in cell/molecular biology, biotechnology, and cancer biology are encouraged to participate.

BIOL 8800. Laboratory Rotations. (2) Prerequisite(s): Admission to the Ph.D. in Biology program. Directed study in an area of specialization. *May be repeated for credit. Graded on a Pass/Unsatisfactory basis.*

BIOL 8999. Doctoral Dissertation Research. (0 to 9)

Prerequisite(s): Admission to the Ph.D. in Biology program. Individual investigation that culminates in the preparation and presentation of a doctoral dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Business Administration Ph.D. (BPHD)

BPHD 8100. Microeconomic Theory I. (3) Prerequisite(s): Admission to Ph.D. in Business Administration or Permission of Instructor. Theories of the firm, of the consumer, and of resource owners; determination of prices under different market structures; general equilibrium analysis and welfare economics.

BPHD 8110. Microeconomic Theory II. (3) Prerequisite(s): BPHD 8100. Study of game theory, its applications in microeconomic theory and finance, and topics on market equilibrium and market failure. The topics cover simultaneous-move games, dynamic games, analysis of competitive markets, market power, adverse selection and the principal-agent problem.

BPHD 8120. Econometrics I. (3) Prerequisite(s): Admission to the Ph.D. in Business Administration or Permission of Instructor. Advanced study of the theory and application of statistics to economic problems. Topics include: the derivation of least squares estimators, maximum likelihood estimation, and problems of multicollinearity, heteroskedasticity, and autocorrelation.

BPHD 8130. Econometrics II. (3) Prerequisite(s): BPHD 8120. Advanced course in cross-section and panel data methods. Focus on underlying assumptions regarding the population, specification, estimation, and testing of microeconomic models. Students become acquainted with a variety of extensions of conventional linear models for cross-sectional and panel data, including panel data models, instrumental variables models, simultaneous equations models, and qualitative response models.

BPHD 8140. Econometrics III. (3) Prerequisite(s): BPHD 8130. Advanced study of the econometric methods applicable to financial economic modeling. Examines the predictability of stock market returns, the event study methodology, single factor and multifactor models, basic principles of portfolio theory and portfolio evaluation. The course also covers topics on volatility modeling and fixed-income securities.

BPHD 8200. Financial Economic Theory I. (3) Prerequisite(s): Admission to Ph.D. in Business Administration program or

permission of instructor. Examines the main themes of financial economics using discrete-time models. Topics include: mean-variance analysis, risk management principle, capital asset pricing model (CAPM), linear factor model, the arbitrage pricing theory, market completes, consumption-based CAPM, multi-period consumption and portfolio choice, market equilibrium, and contingent claim pricing.

BPHD 8210. Investments and Portfolio Theory. (3)

Prerequisite(s): BPHD 8200. Detailed introduction to modern investment and portfolio theory, including asset pricing. Covers standard and non-standard CAPM analysis, APT, stochastic dominance, efficient frontier analysis, optimal portfolio selection, fixed income and bond portfolios, options, futures pricing and evaluation of portfolio performance. The goal of the course is to provide a solid foundation in investments for students who will take further advanced courses in asset pricing.

BPHD 8220. Financial Economic Theory II. (3)

Prerequisite(s): BPHD 8210. Introduction to asset pricing and portfolio choice theory. The course begins with discrete-time models, and then moves to a continuous-time setting. Topics include: arbitrage, stochastic discount factors, beta pricing models, factor models, dynamic programming, derivative securities and models of the term structure of interest rates.

BPHD 8230. Theory of Corporate Finance. (3)

Prerequisite(s): BPHD 8200. Examines the theory and evidence concerning major corporate financial policy issues including capital structure, payout policy, security design and issuance, capital budgeting, mergers and acquisitions, agency theory and financial contracting, and the market for corporate control.

BPHD 8240. Derivatives. (3) Prerequisite(s): BPHD 8200.

Theory and practice of financial derivatives markets including forwards, futures, options and interest rate markets. Topics include: the economics of derivatives markets, pricing models for instruments in these markets, strategies for hedging and speculation, as well as regulatory and governance issues. Special attention is placed on the development of pricing models and advanced analytic techniques.

BPHD 8650. Advanced Seminar in Finance. (3)

Prerequisite(s): Permission of Instructor. Advanced topics in Finance. Topics will vary. *May be repeated for credit with change in topic.*

BPHD 8999. Doctoral Dissertation Research. (1 to 9)

Prerequisite(s): Admission to Candidacy for the Ph.D. in Business Administration. Each student initiates and conducts an individual investigation culminating in the preparation and presentation of a doctoral dissertation.

Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term.

Civil and Environmental Engineering (CEGR)

CEGR 5090. Special Topics in Civil Engineering. (1 to 4)

Study of specific new areas emerging in the various fields of civil engineering. *May be repeated for credit.*

CEGR 5108. Finite Element Analysis and Applications. (3)

Prerequisite(s): CEGR 4224 and permission of department. Finite element method and its application to engineering problems. Application of displacement method to plane stress, plane strain, plate bending and axisymmetrical bodies. Topics include: dynamics, fluid mechanics, and structural mechanics.

CEGR 5122. Power Plant Design. (3) Cross-listed Course(s):

CEGR 4122. Prerequisite(s): CEGR 2102, CEGR 3122, and CEGR 3278. Coverage of basic aspects of power generation, including fossil fuel, nuclear, gas, bio, hydro, solar, and wind; analysis and design of infrastructure components and systems in energy production and distribution facilities with a focus on structural and geotechnical systems; history of energy and power; key governing codes, policies and/or regulations for energy facilities; economic and management comparisons of energy alternatives; quality assurance requirements; layouts of power plant sites.

CEGR 5125. Forensic Engineering. (3) Prerequisite(s): CEGR 3122 and permission of department. Evaluation of structural and construction failures through review of case studies, types and causes of failures, and relevant methods of failure investigation; analysis of failures occurring in a variety of structures, involving a variety of materials, and resulting from a variety of causes; development, expression, and defense of opinions and conclusions, orally and in writing, with an understanding of the impact on the legal process surrounding a failure claim.

CEGR 5126. Codes, Loads, and Nodes. (3) Prerequisite(s):

CEGR 3122 and permission of department. Building systems and components; code requirements according to the latest ASCE Standard 7 pertaining to buildings and other structures; gravity load analysis including dead, live, roof live and snow loads; lateral load analysis focusing on wind and seismic forces, and applied to the main lateral load resisting systems; software applications using the SAP2000 tool, with 2-D and 3-D models loaded with gravity and lateral loads.

CEGR 5128. Matrix Methods of Structural Analysis. (3)

Prerequisite(s): permission of department. Derivation of the

basic equations governing linear structural systems. Application of stiffness and flexibility methods to trusses and frames. Solution techniques utilizing digital computer.

CEGR 5142. Water Treatment Engineering. (3)

Prerequisite(s): CEGR 3141 and permission of department. Analysis and design of water and wastewater treatment processes including: physical, chemical and biological treatment. Computer-aided design of treatment systems.

CEGR 5144. Engineering Hydrology. (3) Prerequisite(s):

CEGR 3143 and permission of department. A quantitative study of the various components of the water cycle, including precipitation, runoff, ground water flow, evaporation and transpiration, and stream flow. Hydrograph analysis, flood routing, frequency and duration, reservoir design, and computer applications.

CEGR 5145. Groundwater Resources Engineering. (3)

Prerequisite(s): CEGR 3143 and permission of department. Overview of hydrological cycle. Principles of groundwater flow and well hydraulics. Regional groundwater flow and flow nets. Water chemistry and contamination. Applications of groundwater modeling.

CEGR 5146. Advanced Engineering Hydraulics. (3)

Prerequisite(s): CEGR 3143 and permission of department. Problems of liquids as applied in civil engineering; open channel flow; dams and spillways; water power; river flow and backwater curves; pipe networks, fire flow, sewage collection, groundwater, computer applications.

CEGR 5147. Stormwater Management. (3) Prerequisite(s):

CEGR 3143, CEGR 3141, permission of instructor, and graduate standing. Introduction to the impacts and water quality parameters due to urbanization. Develop a numerical model to analyze water stormwater impacts and evaluate different mitigation methods. Understand and utilize the guiding principles of low impact design (LID) and evaluate the available BMPs and understand their limitations.

CEGR 5149. Environmental Engineering Principles and Practices. (3) Pre-requisite(s): Civil Engineering Graduate Student. Cross-listed Course(s): CEGR 4149. Students will

learn fundamental science and engineering principles used in environmental engineering and how these principles apply in the functioning of the most common unit processes used in water, wastewater, air, and waste management facilities.

CEGR 5153. Fundamentals of Microbiology. (3) Pre-

requisite(s): Civil Engineering Graduate Student. Cross-listed Course(s): CEGR 4153. Introductory concepts on fundamentals of environmental microbiology to students from different engineering and science disciplines. Students focus on understanding the role of microbiology to

environmental engineering and science. Concepts related to different molecular biology tools used in microbial ecology will be introduced. Fundamentals of microbiology in different natural and biological processes will be discussed.

CEGR 5161. Advanced Traffic Engineering. (3)

Prerequisite(s): CEGR 3161 and permission of department. Analysis of basic characteristics of drivers, vehicles and roadway that affect the performance of road systems. Stream flow elements, volume, density, speed. Techniques of traffic engineering measurements, investigations and data analysis, capacity analysis. Intersections, accidents, parking.

CEGR 5162. Transportation Planning. (3) Prerequisite(s): CEGR 3161 and permission of department. Urban transportation; travel characteristics of urban transportation systems; analysis of transportation-oriented studies; analytic methods of traffic generation, distribution, modal split and assignment; traffic flow theory.

CEGR 5168. Airport Planning and Design. (3) Cross-listed Course(s): CEGR 4168. Prerequisite(s): CEGR 3161 and permission of department. The principles of airport planning and design are studied. Covers essential elements of current airport planning and design trends, including airport master planning and layout plans, forecasting, capacity and delay effects, geometric design and layout of airfields including signage and lighting, and the organization and layout of terminal facilities. Also focuses on environmental planning, such as hazardous wildlife attractants, airport noise, and compatible land use. Additionally, it explores the financing options related to capital development of airports, including grants, passenger facility charges, and bonds.

CEGR 5171. Urban Public Transportation. (3) Prerequisite(s): CEGR 3161 and permission of department. Planning, design, and operation of bus, rail, and other public modes. Relationship between particular modes and characteristics of urban areas. Funding, security and other administrative issues.

CEGR 5181. Human Factors in Traffic Engineering. (3)

Prerequisite(s): CEGR 3161 and permission of department. Study of the driver's and pedestrian's relationship with the traffic system, including roadway, vehicle and environment. Consideration of the driving task, driver and pedestrian characteristics, performance and limitations with regard to traffic facility design and operation.

CEGR 5182. Transportation Environmental Assessment. (3)

Prerequisite(s): permission of department. A study of the environmental impact analysis and assessment procedures for transportation improvements. Route location decisions. Noise, air quality, socio-economic, and other impacts.

CEGR 5185. Geometric Design of Highways. (3)

Prerequisite(s): CEGR 3161 and permission of department. Theory and practice of geometric design of highways including intersections, interchanges, parking and drainage facilities. Driver ability, vehicle performance, safety and economics are considered. Two hours of lecture and three laboratory hours per week.

CEGR 5222. Structural Steel Design II. (3) Prerequisite(s):

CEGR 3221 and permission of department. Analysis and design of structural steel components and systems with emphasis on theories necessary for a thorough understanding of the design of complete structures. Compression members affected by local buckling, beams with lateral-torsional buckling, continuous beams and beam columns are covered. Welded and bolted connections. Current AISC Specifications used.

CEGR 5223. Timber Design. (3) Prerequisite(s): CEGR 3122 and permission of department. Principles of timber design. Design of simple timber structures subjected to gravity loads and lateral forces. Computation of design loads; formulation of structural systems; design/analyze structural components and connections; structural system analysis of timber structures. Analysis of light commercial and residential structures.

CEGR 5224. Advanced Structural Analysis. (3)

Prerequisite(s): CEGR 3122 and permission of department. A continuation of CEGR 3122. Methods to determine deflections in structural members, including moment area, conjugate beam, virtual work, and Castigliano's theorem. Analyze statically indeterminate structures, including approximate method, slope deflection, moment distribution, and matrix stiffness methods. Project to compare analysis techniques and introduce use of structural analysis computer programs.

CEGR 5226. Reinforced Concrete Design II. (3)

Prerequisite(s): CEGR 3225 and permission of department. Analysis and design of reinforced concrete components and systems with emphasis on the fundamental theories necessary for a thorough understanding of concrete structures. Concentrically loaded slender columns, slender columns under compression plus bending. Wall footings and column footings. Analysis of continuous beams and frames. Total design project involving the analysis and design of a concrete structure. Current ACI Specifications used.

CEGR 5242. Wastewater Treatment Plant Design. (3)

Prerequisite(s): Permission of instructor and graduate standing. The design of treatment processes for municipal wastewater treatment plants. Also discusses the basics of physical, biological, and chemical processes and their applications in wastewater treatment.

CEGR 5247. Sustainability. (3) Prerequisite(s): CEGR 3141 and permission of department. Focuses on sustainability as it applies to civil engineering, including land development choices, infrastructure planning, material selection and disposal, energy sources, and water supply and treatment. Methods of assessing sustainability and incorporating sustainable features in design are reviewed.

CEGR 5262. Traffic Engineering. (3) Prerequisite(s): CEGR 3161 and permission of department. Operation and management of street and highway systems. Traffic control systems, traffic flow theory, and highway capacity. Evaluation of traffic engineering alternatives and the conduct of traffic engineering studies.

CEGR 5264. Landfill Design and Site Remediation. (3) Prerequisite(s): CEGR 3258, CEGR 3278, and permission of department. Principles of waste disposal and sanitary landfill siting including design, construction, operation and maintenance. Site assessment of underground storage tank leaks; site remediation, and clean up technologies using choice and economic analysis and computer applications.

CEGR 5270. Earth Pressures and Retaining Structures. (3) Prerequisite(s): CEGR 3122, CEGR 3278, CEGR 4278, and permission of the department. Corequisite(s): CEGR 4278 can be a corequisite. Lateral earth pressure theory and the effects of wall friction, external loads, groundwater, and layered soils; design procedures and construction details associated with selected rigid and modular gravity/semi-gravity walls, mechanically stabilized earth walls, and externally supported structural walls.

CEGR 5271. Pavement Design. (3) Prerequisite(s): CEGR 3161, CEGR 3278, and permission of department. Pavement design concepts and considerations; engineering properties of pavement materials including soils, bases, asphalt concrete, and Portland cement concrete; design of flexible and rigid pavements including shoulders and drainage; computer applications for pavement analysis and design.

CEGR 5272. Design with Geosynthetics. (3) Prerequisite(s): CEGR 3258, CEGR 3278, and permission of department. Pre- or Corequisite(s): CEGR 5278. Introduction to geosynthetic materials, properties, laboratory test procedures, and functions; geosynthetic design methods used for geotechnical, transportation hydraulic, and geo-environmental applications (roadways, walls, slopes, foundation soils, landfills, and dams); the incorporation of geosynthetics for soil reinforcement, separation, filtration, drainage and containment.

CEGR 5273. Engineering Ground Improvement. (3) Prerequisite(s): CEGR 3278 and permission of department. Engineering principles of soil improvement as they relate to

applications in both geotechnical and geoenvironmental engineering; innovative techniques to improve soils to meet technical and economic requirements.

CEGR 5278. Geotechnical Engineering II. (3) Prerequisite(s): CEGR 3258, CEGR 3278, and permission of department. Design of shallow and deep foundations, including structural considerations; lateral earth pressure theories; design of rigid and flexible earth retaining structures; advanced aspects of slope stability analysis; and computer applications. (*Spring*)

CEGR 6090. Special Topics in Civil Engineering. (1 to 6) Prerequisite(s): Permission of department. Directed study of current topics of special interest. *May be repeated for credit.*

CEGR 6122. Advanced Topics in Structural Steel. (3) Prerequisite(s): CEGR 4222 and permission of department. Theory of plastic-behavior of steel structures; current topics in structural steel.

CEGR 6124. Masonry Design. (3) Cross-listed Course(s): CEGR 8124. Prerequisite(s): CEGR 3225 and permission of department. Introduction of masonry materials and systems, engineering and materials properties and testing procedures. Design of reinforced and unreinforced masonry (clay and concrete) walls, beams, and columns for vertical, wind, and seismic loads. Analysis and design of masonry structures and introduction to computer applications.

CEGR 6125. Structural Strengthening. (3) Cross-listed Course(s): CEGR 8125. Prerequisite(s): CEGR 3221, CEGR 3225, and permission of department. Code requirements for the evaluation of existing structures; analysis of existing structures; performance based design of buildings and bridges; strengthening/retrofit techniques for concrete, structural steel, masonry and timber elements, such as beams, columns, shear/bearing/retaining walls, and slabs; studies of actual strengthening projects using innovative techniques and materials.

CEGR 6126. Analysis of Plates and Shells. (3) Cross-listed Course(s): CEGR 8126. Prerequisite(s): CEGR 4224 and permission of department. Analysis of rectangular and circular plates using classical as well as numerical methods; orthotropic and continuous plates and plate buckling. Analysis of thin shells and shells of revolution with and without bending; membrane theory of cylindrical shells; symmetric and unsymmetric loading; pipes, tanks, and pressure vessels; computer applications.

CEGR 6127. Fracture Mechanics and Fatigue. (3) Cross-listed Course(s): CEGR 8127. Prerequisite(s): CEGR 3221 and permission of department. Introduction to fracture mechanics and fatigue, including Griffith Theory, plane

strain-stress conditions, critical stress intensity factors, factors influencing fracture toughness, fracture mechanics design principles, fatigue performance, and fatigue initiation and propagation.

CEGR 6128. Structural Optimization. (3) Cross-listed Course(s): CEGR 8128. Prerequisite(s): CEGR 4224 and permission of department. Introduction to optimization concepts; reformulation of common structural analysis and design problems to an optimization format; optimization of constrained, unconstrained, linear, and nonlinear problems by classical and numerical techniques; and computer applications.

CEGR 6129. Structural Dynamics. (3) Cross-listed Course(s): CEGR 8129. Prerequisite(s): CEGR 3122 and permission of department. Methods for dynamic analysis of single and multiple degree of freedom systems. Topics include: free vibrations, dynamic response of simple structures under time dependent loads (e.g., harmonic, periodic, impulsive, general dynamic loading), support motion, frequency domain analysis, response spectra, earthquake engineering.

CEGR 6141. Water Quality Modeling. (3) Cross-listed Course(s): CEGR 8141. Prerequisite(s): Permission of department. Mathematical modeling of water quality in receiving streams including: generation of point and nonpoint sources of pollution; formulation of transport equations for contaminants in stream and estuarine water; and prediction of the fate, persistence and transformation of chemical pollutants in aquatic ecosystems. Computer model simulation and case studies.

CEGR 6144. Environmental Biotechnology. (3) Cross-listed Course(s): CEGR 8144. Prerequisite(s): Permission of department. Application of biotechnology to the management of environmental problems. Study of bioprocess principles, bioremediation of waste disposal sites, cell immobilization technology and innovative biotechnologies.

CEGR 6151. Research Methods in Civil and Environmental Engineering. (3) Prerequisite(s): Civil Engineering Graduate Student. Cross-listed Course(s): CEGR 8151. Prepares graduate students for conducting research in academic and non-academic settings. Teaches students how to find and critically evaluate resources, how to build and test a research hypothesis, and how to communicate research results to a variety of audiences in oral and written format.

CEGR 6161. Traffic Control and Operation. (3) Cross-listed Course(s): CEGR 8161. Prerequisite(s): CEGR 5161 and permission of department. Traffic control theory and application; traffic regulation, laws and ordinances; speed control, intersection control, flow control and parking control; design and application of control devices,

investigation, evaluation techniques; statistical analysis; administration. (*Spring*)

CEGR 6162. Computer Applications for Transportation Engineers. (3) Cross-listed Course(s): CEGR 8162. Prerequisite(s): CEGR 3161 and permission of department. Apply analytical techniques using traffic simulation and transportation planning software to evaluate various transportation facilities; Emphasis on computer applications and software packages such as HCS, SYNCHRO/SimTraffic, and VISSIM; 4-Step planning process using TransCAD; Build mathematical models.

CEGR 6163. GIS for Civil Engineers. (3) Cross-listed Course(s): CEGR 8163. Prerequisite(s): CEGR 2101 and permission of department. Apply Geographic Information System (GIS) tools to solve Civil Engineering problems: add layers, label, and symbolize features, create maps in ArcMap, generate tables and spatial databases, address matching, query and join tables, perform spatial overlays, generate buffers, and conduct spatial analysis. Civil Engineering case studies.

CEGR 6164. Traffic Safety. (3) Cross-listed Course(s): CEGR 8164. Prerequisite(s): CEGR 3161 and permission of department. Crash data elements and source of data; Crash site reconstruction; Quantifying risk; Safety evaluation process: Problem definition, high crash locations, ranking and prioritization, understanding causal factors, countermeasure selection, before-after evaluation; Crash prediction Modeling; Economic appraisal; Safety conscious planning.

CEGR 6165. Urban Systems Engineering. (3) Prerequisite(s): CEGR 3202 and permission of department. Survey of economic, political, sociological and technological factors affecting modern growth; a planning process and its role in solving selected urban problems with emphasis on engineering contributions.

CEGR 6166. Urban Transportation Networks: Operations and Optimization. (3) Cross-listed Course(s): CEGR 8166. Prerequisite(s): CEGR 3161, permission of department, and graduate standing. Introduction to planning and optimization techniques for the analysis of transportation networks. Principles of precise algorithms for finding transport network equilibrium flows and applications that relate to these flows. Topics include: basic optimization skills, shortest path algorithms, user equilibrium, system optimal, elastic demand, OD matrix estimation, network design, congestion pricing, and stochastic user equilibrium.

CEGR 6167. Discrete Choice Modeling. (3) Cross-listed Course(s): CEGR 8167. Prerequisite(s): CEGR 3161, permission of department, and graduate standing. Introduction to elements of the choice process; utility-based choice theory; principles of binary choice models;

multinomial logit models; nested logit models; and ordered response models.

CEGR 6173. Environmental Aquatic Chemistry. (3) Cross-listed Course(s): CEGR 8173. Prerequisite(s): CHEM 3111, CEGR 3141, or equivalent; and permission of department. Concepts of chemical equilibrium applied to natural aquatic systems. Topics include: acid-base reactions, buffer systems, mineral precipitation, coordinate chemistry, redox reactions, adsorption phenomena and chemical-equilibria computer programs.

CEGR 6181. Traffic Flow Theory. (3) Cross-listed Course(s): CEGR 8181. Prerequisite(s): CEGR 5161 and permission of department. Logical foundations and mathematical representation of traffic flow; interrelation between microscopic and macroscopic equations of motion for highway traffic; stochastic properties of traffic at low and moderate densities. Car-following theories of traffic flow at high densities. Applications of queuing theory.

CEGR 6182. Transportation Systems Analysis. (3) Cross-listed Course(s): CEGR 8182. Prerequisite(s): CEGR 5161 and permission of department. Issues, concepts and methods of transportation systems engineering and planning. Decision making in transportation management. The application of analytical methods to the development and evaluation of transport systems.

CEGR 6183. Intelligent Transportation Systems (ITS). (3) Cross-listed Course(s): CEGR 8183. Prerequisite(s): CEGR 3161 and permission of department. An introduction and overview of Intelligent Transportation Systems (ITS), ITS architecture, advanced technologies for data collection and transportation system management, advanced traveler information systems (ATIS), advanced traffic management systems (ATMS), advanced public transportation systems (APTS), commercial vehicle operations (CVO), electronic toll operations, ITS models and evaluation methods, advanced rural transportation systems (ARTS), and connected/autonomous/driverless vehicles.

CEGR 6222. Experimental Structural Mechanics and Nondestructive Evaluation. (3) Cross-listed Course(s): CEGR 8222. Prerequisite(s): Permission of instructor and graduate standing. A comprehensive overview of experimental techniques used to develop phenomenological understanding of and characterization of solid mechanics, stress analysis, and fracture mechanics problems. Additionally presented are experimental methods routinely employed for nondestructive evaluation of in-service structures, structural components, and structural materials. Students are expected to develop a familiarity with and ability to conduct data acquisition, signal processing, and data interpretation.

CEGR 6223. Introduction to Structures in Fire. (3) Cross-listed Course(s): CEGR 8223. Characteristics of natural and standard fires. Fundamentals of heat transfer in fire. Thermal and mechanical properties and performance of steel, concrete, timber, and fire protection materials and elements at elevated temperatures. Discussion of prescriptive and performance-based codes. Use of finite element software for thermal analysis.

CEGR 6224. Introduction to Power Transmission Structure Designs. (3) Cross-listed Course(s): CEGR 8224. Introduction to the fundamentals of power transmission infrastructure and power grid systems and the stability designs of power transmission structures.

CEGR 6225. Forensic Investigations. (3) Cross-listed Course(s): CEGR 8225. Applying engineering principles and deductive reasoning to the investigation of failures of civil engineering (CE) systems. While structural systems are emphasized, other systems, such as geotechnical or geotechnical/structural systems, are also investigated. Clear and concise communication of findings (field/laboratory investigations), assumptions, and conclusions are required through written reports, projects, and presentations with an understanding of ramifications to the legal process involved in a failure claim. Approximately half of the course involves self-directed research of CE system failures of interest to the student.

CEGR 6226. Structural Systems. (3) Cross-listed Course(s): CEGR 8226. Explores the various types of structural systems, configuration, system determinacy and requirements for static stability, and load flow through the system. Strength and serviceability requirements are only addressed at a conceptual level, since detailed treatment is addressed in material-specific structural design courses (e.g. steel, reinforced concrete, prestressed concrete, masonry, timber). The following key concepts are studied as they pertain to the structural system: vertical load/lateral force types, form/configuration, member and structural component types, connection types and strategies for their usage, and connecting members and structural components together to comprise practical structural systems.

CEGR 6243. Physical Processes in Environmental Systems. (3) Cross-listed Course(s): CEGR 8243. Prerequisite(s): CEGR 3141, CEGR 3143, MATH 2171, and permission of department. Physical processes that describe the behavior of materials in natural and engineered environmental systems including transport, diffusion/dispersion, volatilization, sorption/desorption, flocculation, filtration, and sedimentation.

CEGR 6244. Chemical Fate and Transport. (3) Cross-listed Course(s): CEGR 8244. Prerequisite(s): CEGR 3141 and permission of department. Fate of chemicals in the

environment and transport processes within and between phases; Environmental chemo-dynamics; Volatilization, dissolution and adsorption from an equilibrium perspective; Evaluation of mass transfer kinetics across environmental compartments.

CEGR 6245. Chemical and Biological Processes in Environmental Systems. (3) Prerequisite(s): CHEM 1251, CEGR 3141, and permission of department. Chemical and biological processes that describe the behavior of materials in natural and engineered environmental systems. Chemical processes to be covered may include acid-base reactions, equilibrium partitioning, pH buffering, precipitation/dissolution, complex formation, adsorption, oxidation-reduction, coagulation, and adsorption. Fundamentals of biological theories to be covered may include kinetics, bioenergetics, genetics, and cellular functions.

CEGR 6251. Foundation Engineering. (3) Cross-listed Course(s): CEGR 8251. Prerequisite(s): CEGR 3278 and permission of department. Methodologies for analysis and design of deep foundations including different construction layouts and configurations (e.g., single and group piles), different installation techniques (e.g., driven, drilled, ACIP, etc.), different loading conditions (e.g., axial compression, axial tension, lateral, general loading, etc), different design approaches (e.g., allowable stress design – ASD, and load and resistance factor design - LRFD), among other topics; New emerging technologies, construction and inspection aspects and their implications on deep foundation design, and other topics.

CEGR 6252. Soil Dynamics and Earthquake Engineering. (3) Cross-listed Course(s): CEGR 8252. Prerequisite(s): CEGR 3122, CEGR 3278, and permission of department. Review of the dynamics of single and multi-degree of freedom systems. Earthquake mechanism, distribution, magnitude, intensity, ground shaking, site effects, prediction, and response spectra. Soil liquefaction; aseismic design of foundations; seismic codes; and machine foundation design.

CEGR 6254. Experimental Soil Mechanics. (3) Cross-listed Course(s): CEGR 8254. Prerequisite(s): CEGR 3278 and permission of department. Experimental methods, with emphasis on laboratory tests, to determine engineering soil properties and investigate soil behavior; 1) classification tests (i.e., used to identify soil classification and identify general engineering behavior type); and 2) assessment of engineering properties, such as permeability, shear strength, stiffness, and compressibility. Primary lab tests to be covered in this course are: consolidation, direct shear, static tri-axial, cyclic tri-axial, cyclic simple shear, resonant column, and other advanced geotechnical laboratory tests. Also includes discussion on field sampling and testing,

reconstituted samples, laboratory instrumentation, and measurement techniques.

CEGR 6255. Slope Stability and Earth Structures. (3) Prerequisite(s): CEGR 3278 and permission of department. Soil and rock slope stability including the aspects of analysis, design, and stabilization within a geotechnical framework; Concepts related to seepage analysis of isotropic and anisotropic soil structures to relate the influence of groundwater conditions in slope stability problems; Presentation of slope stability analysis procedures based on limit equilibrium principles and stress-deformation analyses; Stability considerations of natural slopes and human-made soil structures. Computer software for seepage and slope stability analysis is explained.

CEGR 6262. Connected and Autonomous Vehicles. (3) Cross-listed Course(s): CEGR 8262. Prerequisite(s): CEGR 3161. Concepts and basics of connected vehicles (CVs) and autonomous vehicles (AVs), the technology used for CVs and AVs, the CV pilot deployment program and current status of AVs, the impact of CVs and AVs on safety, mobility, and the environment, etc., and existing research on CVs and AVs, as well as conduct literature reviews and case studies involving CVs and AVs.

CEGR 6268. Advanced Soil Mechanics. (3) Cross-listed Course(s): CEGR 8268. Prerequisite(s): CEGR 3258, CEGR 3278, and permission of department. One and two-dimensional consolidation, layered strata effects, and creep; seepage in layered strata, flow net, and seepage forces; shear strength parameters, effective and total stress paths, and application for slope stability evaluation; principles of critical state soil mechanics; computer applications.

CEGR 6891. Graduate Master Project. (3) Prerequisite(s): Permission of department. Individual investigation or exposition of results for the 3-hour Master project.

CEGR 6892. Individualized Study. (3) Prerequisite(s): Permission of department. Individual investigation or exposition of results for the 3-hour study.

CEGR 6990. Industrial Internship. (1 to 3) Prerequisite(s): Completion of 9 credit hours of graduate coursework. Full- or part-time academic year internship in engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by their graduate program director and requires a mid-term report and final report to be graded by the supervising faculty. *Graded on a Pass/Unsatisfactory basis.* Credit hours gained from Internship shall not be part of the minimum credit hours requirement for graduation.

CEGR 6991. Graduate Master Thesis. (1 to 6) Prerequisite(s): Permission of department. Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

CEGR 6999. Graduate Master Additional Work. (1 to 3) Prerequisite(s): Permission of department. Each student initiates or continues an individual investigation culminating in the preparation and presentation of a deliverable (could be part of Master Thesis or Project), upon meeting the 30-credit hour degree requirement. *Graded on a Pass/Unsatisfactory or IP basis. May be repeated for credit.*

CEGR 8090. Special Topics. Directed study of current topics of special interest. *(See the Infrastructure and Environmental Systems heading for details.)*

CEGR 8124. Masonry Design. (3) Cross-listed Course(s): CEGR 6124. Prerequisite(s): CEGR 3225 and permission of department. Introduction of masonry materials and systems, engineering and materials properties and testing procedures. Design of reinforced and unreinforced masonry (clay and concrete) walls, beams, and columns for vertical, wind, and seismic loads. Analysis and design of masonry structures and introduction to computer applications.

CEGR 8125. Structural Strengthening. (3) Cross-listed Course(s): CEGR 6125. Prerequisite(s): CEGR 3221, CEGR 3225, and permission of department. Code requirements for the evaluation of existing structures; analysis of existing structures; performance based design of buildings and bridges; strengthening/retrofit techniques for concrete, structural steel, masonry and timber elements, such as beams, columns, shear/bearing/retaining walls, and slabs; studies of actual strengthening projects using innovative techniques and materials.

CEGR 8126. Analysis of Plates and Shells. (3) Cross-listed Course(s): CEGR 6126. Prerequisite(s): CEGR 4224 and permission of department. Analysis of rectangular and circular plates using classical as well as numerical methods; orthotropic and continuous plates and plate buckling. Analysis of thin shells and shells of revolution with and without bending; membrane theory of cylindrical shells; symmetric and unsymmetric loading; pipes, tanks, and pressure vessels; computer applications.

CEGR 8127. Fracture Mechanics and Fatigue. (3) Cross-listed Course(s): CEGR 6127. Prerequisite(s): CEGR 3221 and permission of department. Introduction to fracture mechanics and fatigue, including Griffith Theory, plane strain-stress conditions, critical stress intensity factors,

factors influencing fracture toughness, fracture mechanics design principles, fatigue performance, and fatigue initiation and propagation.

CEGR 8128. Structural Optimization. (3) Cross-listed Course(s): CEGR 6128. Prerequisite(s): CEGR 4224 and permission of department. Introduction to optimization concepts; reformulation of common structural analysis and design problems to an optimization format; optimization of constrained, unconstrained, linear, and nonlinear problems by classical and numerical techniques; and computer applications.

CEGR 8129. Structural Dynamics. (3) Cross-listed Course(s): CEGR 6129. Prerequisite(s): CEGR 3122 and permission of department. Methods for dynamic analysis of single and multiple degree of freedom systems. Topics include: free vibrations, dynamic response of simple structures under time dependent loads (e.g., harmonic, periodic, impulsive, general dynamic loading), support motion, frequency domain analysis, response spectra, earthquake engineering.

CEGR 8141. Water Quality Modeling. (3) Cross-listed Course(s): CEGR 6141. Prerequisite(s): Permission of department. Mathematical modeling of water quality in receiving streams including: generation of point and nonpoint sources of pollution; formulation of transport equations for contaminants in stream and estuarine water; and prediction of the fate, persistence and transformation of chemical pollutants in aquatic ecosystems. Computer model simulation and case studies.

CEGR 8144. Environmental Biotechnology. (3) Cross-listed Course(s): CEGR 6144. Prerequisite(s): Permission of department. Application of biotechnology to the management of environmental problems. Study of bioprocess principles, bioremediation of waste disposal sites, cell immobilization technology and innovative biotechnologies.

CEGR 8151. Research Methods. (3) Prerequisite(s): Enrollment in Ph.D. in Civil Engineering program and permission of department. Cross-listed Course(s): CEGR 6151. Prepares graduate students for conducting research in academic and non-academic settings. Teaches students how to find and critically evaluate resources, how to build and test research hypothesis, and how to communicate research results to a variety of audiences in oral and written format.

CEGR 8161. Traffic Control and Operation. (3) Cross-listed Course(s): CEGR 6161. Prerequisite(s): CEGR 5161 and permission of department. Traffic control theory and application; traffic regulation, laws and ordinances; speed control, intersection control, flow control and parking control; design and application of control devices,

investigation, evaluation techniques; statistical analysis; administration. (*Spring*)

CEGR 8162. Computer Applications for Transportation Engineers. (3) Cross-listed Course(s): CEGR 6162.

Prerequisite(s): CEGR 3161 and permission of department. Apply analytical techniques using traffic simulation and transportation planning software to evaluate various transportation facilities; Emphasis on computer applications and software packages such as HCS, SYNCHRO/SimTraffic, and VISSIM; 4-Step planning process using TransCAD; Build mathematical models.

CEGR 8163. GIS for Civil Engineers. (3) Cross-listed Course(s): CEGR 6163. Prerequisite(s): CEGR 2101 and permission of department. Apply Geographic Information System (GIS) tools to solve Civil Engineering problems: add layers, label, and symbolize features, create maps in ArcMap, generate tables and spatial databases, address matching, query and join tables, perform spatial overlays, generate buffers, and conduct spatial analysis. Civil Engineering case studies.

CEGR 8164. Traffic Safety. (3) Cross-listed Course(s): CEGR 6164. Prerequisite(s): CEGR 3161 and permission of department. Crash data elements and source of data; Crash site reconstruction; Quantifying risk; Safety evaluation process: Problem definition, high crash locations, ranking and prioritization, understanding causal factors, countermeasure selection, before-after evaluation; Crash prediction Modeling; Economic appraisal; Safety conscious planning.

CEGR 8166. Urban Transportation Networks: Operations and Optimization. (3) Cross-listed Course(s): CEGR 6166. Prerequisite(s): CEGR 3161, permission of department, and graduate standing. Introduction to planning and optimization techniques for the analysis of transportation networks. Principles of precise algorithms for finding transport network equilibrium flows and applications that relate to these flows. Topics include: basic optimization skills, shortest path algorithms, user equilibrium, system optimal, elastic demand, OD matrix estimation, network design, congestion pricing, and stochastic user equilibrium.

CEGR 8167. Discrete Choice Modeling. (3) Cross-listed Course(s): CEGR 6167. Prerequisite(s): CEGR 3161, permission of department, and graduate standing. Introduction to elements of the choice process; utility-based choice theory; principles of binary choice models; multinomial logit models; nested logit models; and ordered response models.

CEGR 8173. Environmental Aquatic Chemistry. (3) Cross-listed Course(s): CEGR 6173. Prerequisite(s): CHEM 3111, CEGR 3141, or equivalent; and permission of department. Concepts of chemical equilibrium applied to natural

aquatic systems. Topics include: acid-base reactions, buffer systems, mineral precipitation, coordinate chemistry, redox reactions, adsorption phenomena and chemical-equilibria computer programs.

CEGR 8181. Traffic Flow Theory. (3) Cross-listed Course(s): CEGR 6181. Prerequisite(s): CEGR 5161 and permission of department. Logical foundations and mathematical representation of traffic flow; interrelation between microscopic and macroscopic equations of motion for highway traffic; stochastic properties of traffic at low and moderate densities. Car-following theories of traffic flow at high densities. Applications of queuing theory.

CEGR 8182. Transportation Systems Analysis. (3) Cross-listed Course(s): CEGR 6182. Prerequisite(s): CEGR 5161 and permission of department. Issues, concepts and methods of transportation systems engineering and planning. Decision making in transportation management. The application of analytical methods to the development and evaluation of transport systems.

CEGR 8183. Intelligent Transportation Systems (ITS). (3) Cross-listed Course(s): CEGR 6183. Prerequisite(s): CEGR 3161 and permission of department. An introduction and overview of Intelligent Transportation Systems (ITS), ITS architecture, advanced technologies for data collection and transportation system management, advanced traveler information systems (ATIS), advanced traffic management systems (ATMS), advanced public transportation systems (APTS), commercial vehicle operations (CVO), electronic toll operations, ITS models and evaluation methods, advanced rural transportation systems (ARTS), and connected/autonomous/driverless vehicles.

CEGR 8222. Experimental Structural Mechanics and Nondestructive Evaluation. (3) Cross-listed Course(s): CEGR 6222. Prerequisite(s): Permission of instructor and graduate standing. A comprehensive overview of experimental techniques used to develop phenomenological understanding of and characterization of solid mechanics, stress analysis, and fracture mechanics problems. Additionally presented are experimental methods routinely employed for nondestructive evaluation of in-service structures, structural components, and structural materials. Students are expected to develop a familiarity with and ability to conduct data acquisition, signal processing, and data interpretation.

CEGR 8223. Introduction to Structures in Fire. (3) Cross-listed Course(s): CEGR 6223. Characteristics of natural and standard fires. Fundamentals of heat transfer in fire. Thermal and mechanical properties and performance of steel, concrete, timber, and fire protection materials and elements at elevated temperatures. Discussion of

prescriptive and performance-based codes. Use of finite element software for thermal analysis.

CEGR 8224. Introduction to Power Transmission Structure Designs. (3) Cross-listed Course(s): CEGR 6224.

Introduction to the fundamentals of power transmission infrastructure and power grid systems and the stability designs of power transmission structures.

CEGR 8225. Forensic Investigations. (3) Cross-listed Course(s): CEGR 6225. Applying engineering principles and deductive reasoning to the investigation of failures of civil engineering (CE) systems. While structural systems are emphasized, other systems, such as geotechnical or geotechnical/structural systems, are also investigated. Clear and concise communication of findings (field/laboratory investigations), assumptions, and conclusions are required through written reports, projects, and presentations with an understanding of ramifications to the legal process involved in a failure claim. Approximately half of the course involves self-directed research of CE system failures of interest to the student.

CEGR 8226. Structural Systems. (3) Cross-listed Course(s): CEGR 6226. Explores the various types of structural systems, configuration, system determinacy and requirements for static stability, and load flow through the system. Strength and serviceability requirements are only addressed at a conceptual level, since detailed treatment is addressed in material-specific structural design courses (e.g. steel, reinforced concrete, prestressed concrete, masonry, timber). The following key concepts are studied as they pertain to the structural system: vertical load/lateral force types, form/configuration, member and structural component types, connection types and strategies for their usage, and connecting members and structural components together to comprise practical structural systems.

CEGR 8244. Chemical Fate and Transport. (3) Cross-listed Course(s): CEGR 6244. Prerequisite(s): CEGR 3141 and permission of department. Fate of chemicals in the environment and transport processes within and between phases; Environmental chemo-dynamics; Volatilization, dissolution and adsorption from an equilibrium perspective; Evaluation of mass transfer kinetics across environmental compartments.

CEGR 8251. Foundation Engineering. (3) Cross-listed Course(s): CEGR 6251. Prerequisite(s): CEGR 3278 and permission of department. Methodologies for analysis and design of deep foundations including different construction layouts and configurations (e.g., single and group piles), different installation techniques (e.g., driven, drilled, ACIP, etc.), different loading conditions (e.g., axial compression, axial tension, lateral, general loading, etc), different design approaches (e.g., allowable stress design – ASD, and load

and resistance factor design - LRFD), among other topics; New emerging technologies, construction and inspection aspects and their implications on deep foundation design, and other topics.

CEGR 8252. Soil Dynamics and Earthquake Engineering. (3)

Cross-listed Course(s): CEGR 6252. Prerequisite(s): CEGR 3122, CEGR 3278, and permission of department. Review of the dynamics of single and multi-degree of freedom systems. Earthquake mechanism, distribution, magnitude, intensity, ground shaking, site effects, prediction, and response spectra. Soil liquefaction; aseismic design of foundations; seismic codes; and machine foundation design.

CEGR 8254. Experimental Soil Mechanics. (3) Cross-listed Course(s): CEGR 6254. Prerequisite(s): CEGR 3278 and permission of department. Experimental methods, with emphasis on laboratory tests, to determine engineering soil properties and investigate soil behavior; 1) classification tests (i.e., used to identify soil classification and identify general engineering behavior type); and 2) assessment of engineering properties, such as permeability, shear strength, stiffness, and compressibility. Primary lab tests to be covered in this course are: consolidation, direct shear, static tri-axial, cyclic tri-axial, cyclic simple shear, resonant column, and other advanced geotechnical laboratory tests. Also includes discussion on field sampling and testing, reconstituted samples, laboratory instrumentation, and measurement techniques.

CEGR 8262. Connected and Autonomous Vehicles. (3)

Cross-listed Course(s): CEGR 6262. Concepts and basics of connected vehicles (CVs) and autonomous vehicles (AVs), the technology used for CVs and AVs, the CV pilot deployment program and current status of AVs, the impact of CVs and AVs on safety, mobility, and the environment, etc., and existing research on CVs and AVs, as well as conduct literature reviews and case studies involving CVs and AVs.

CEGR 8268. Advanced Soil Mechanics. (3) Cross-listed

Course(s): CEGR 6268. Prerequisite(s): CEGR 3258, CEGR 3278, and permission of department. One and two-dimensional consolidation, layered strata effects, and creep; seepage in layered strata, flow net, and seepage forces; shear strength parameters, effective and total stress paths, and application for slope stability evaluation; principles of critical state soil mechanics; computer applications.

CEGR 8892. Individualized Study. (3) Prerequisite(s):

Enrollment in Ph.D. in Civil Engineering program and permission of department. Individual investigation or exposition of results for the 3-hour study. Each doctoral student with Advanced Standing is limited to one individual study class within the 42-credit hour requirement, while

each regular doctoral student is limited to two individual study classes within the 72-credit hour requirement. *May be repeated for credit with change of topic or project, and not part of dissertation research.*

CEGR 8991. Doctoral Dissertation. (1 to 6) Prerequisite(s): Enrollment in Ph.D. in Civil Engineering program and permission of department. Individual investigation culminating in the preparation and presentation of a dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.* CE Ph.D. students are required to complete 18 credit hours of dissertation research.

Chemistry (CHEM)

CHEM 5090. Special Topics in Chemistry. (1 to 4) Prerequisite(s): Permission of instructor. Selected topics in chemistry. Lecture and/or laboratory hours will vary with the nature of the course taught. *May be repeated for credit.*

CHEM 5111. Instrumental Analysis. (3 to 4) Prerequisite(s): Permission of instructor. Selected modern instrumental methods of analysis, including theory and practice, with considerable attention given to the instrument and elementary electronics involved in the techniques. Two lecture hours and six hours of lab per week.

CHEM 5121. Advanced Inorganic Chemistry. (3 to 4) Prerequisite(s): Permission of instructor. A review of atomic structure and bonding, a survey of the synthesis, structure, and reactivity of the elements and their most important compounds, a discussion of key industrial processes dealing with the preparation of inorganic compounds, and an overview of coordination and organometallic chemistry. Laboratory work involves inorganic preparations and characterization techniques. Three lecture hours and one laboratory period of three hours a week.

CHEM 5133. Methods of Organic Structure Determination. (2) Prerequisite(s): Permission of instructor. Study and application of modern techniques, primarily spectroscopy, to determine the structure of organic molecules. One hour of lecture and one laboratory period of three hours each week.

CHEM 5134. Organic Reaction Mechanisms. (2) Prerequisite(s): Permission of instructor. Mechanistic and theoretical topics which are beyond the scope of CHEM 2131 and CHEM 2132, including orbital symmetry control of organic reactions, the Hammett equation and other linear free energy relationships, heterocyclic compounds, polycyclic aromatic compounds, organic photochemistry,

carbenes, nitrenes, arynes and other short lived, reactive intermediates.

CHEM 5165. Principles of Biochemistry I. (3) Prerequisite(s): satisfactory score on an organic chemistry proficiency exam, or permission of instructor. A study of the structures, properties, and functions of biological molecules, bioenergetics of biological reactions, and enzyme catalysis, with particular emphasis on the underlying chemical principles, including thermodynamics and kinetics.

CHEM 5165L. Principles of Biochemistry I Laboratory. (1) Pre- or Corequisite(s): CHEM 5165. Physical properties of biological molecules and an introduction to experimental techniques in biochemical research. Eleven four-hour lab periods.

CHEM 5166. Principles of Biochemistry II. (3) Prerequisite(s): CHEM 5165 with a grade of B or above. A study of various metabolic pathways and information transfer including molecular aspects of cell biology and genetics, with particular emphasis on the underlying chemical reactions, including thermodynamics and kinetics.

CHEM 5200. Computational Chemistry. (4) Pre- or Corequisite(s): Permission of instructor. Electronic and molecular mechanics-based computational methods, including properties, optimized equilibrium and transition state structures and potential energy surfaces of reactions. Three lecture hours and three hours of laboratory each week. Additional projects required of graduate students.

CHEM 6060. Special Topics and Investigations. (1 to 3) Prerequisite(s): Permission of instructor. Directed study of topics of current chemical interest. *May be repeated for credit.*

CHEM 6069. Topics in Biochemistry. (3) Prerequisite(s): CHEM 6165 or permission of instructor. Discussion of current topics in biochemistry emphasizing their biomedical/biotechnological aspects from a bioinorganic chemistry perspective, bioorganic chemistry, bioanalytical chemistry, biophysical chemistry, biocomputational chemistry, biomaterials. *May be repeated for credit.* Three lecture hours per week.

CHEM 6101. Biochemical Principles. (4) Prerequisite(s): Admission to the graduate program or permission of instructor. Molecular biophysics of biological molecules. Bioenergetics of biological reactions and enzyme structure, mechanisms, and regulation. Metabolic pathways and the role of cellular organelles. Biochemical analysis methodology. Thirty-one two-hour lectures.

CHEM 6102. Nanoscale Phenomena. (3) Cross-listed Course(s): NANO 8102, OPTI 6302, and OPTI 8302. Topics

include: scaling phenomena; nano-optics (near-field optics, limits of lithography masks, nano-dots and nanoscale optical interactions); nanoscale mechanics; nanotribology; biological and biologically-inspired machines.

CHEM 6103. Synthesis and Characterization of Nanomaterials. (3) Cross-listed Course(s): NANO 8103. Prerequisite(s): CHEM 6102 or permission of instructor. Topics include: quantum dots, metallic nanoparticles, carbon nanostructured materials and nanotubes, zeolites, organic-inorganic polymers, composite materials, solution-phase colloids, sol-gel process, silica spheres porous silicon, photonic crystals.

CHEM 6115. Advanced Analytical Chemistry. (3) Prerequisite(s): CHEM 5111 with a grade of B or above, or permission of instructor. The application of modern analytical methods to chemical problems. Emphasis is upon chemical information, particularly structural, obtainable from these techniques. *May be repeated for credit.*

CHEM 6126. Organometallic Chemistry. (3) Prerequisite(s): Permission of instructor. Recommended Pre- or Corequisite(s): CHEM 5133. Synthesis, structure, characterization, and reactivity of organometallic compounds; introduction to catalysis and bioorganometallic chemistry. Three lecture hours each week.

CHEM 6135. Advanced Organic Chemistry. (3) Prerequisite(s): CHEM 5133 and CHEM 5134 with grade of B or above, or permission of instructor. A qualitative discussion of modern mechanistic interpretation of the relations between structure and reactivity. Special emphasis is placed on the role of reactive intermediates such as carbocations, carbanions, carbenes, and radicals.

CHEM 6147. Molecular Photochemistry and Photophysics. (3) Prerequisite(s): Admission to graduate program or permission of instructor. An investigation of the excited states of organic molecules and the photophysics governing radiative and nonradiative transitions. Topics include: electronic orbitals, absorption, emission, potential energy surfaces, energy transfer, photophysical radiationless transitions, singlet oxygen and chemiluminescent organic reactions. Three lecture hours per week.

CHEM 6150. Seminar-Internship. (1 to 3) Prerequisite(s): Permission of instructor. Required for all teaching assistants. Supervised experience in the teaching of college chemistry. *May be repeated for credit.*

CHEM 6155. Polymer Synthesis. (3) Prerequisite(s): Permission of instructor. Polymer structure, classification of polymerization reactions, theory and practice of step growth polymerization, radical, ionic and ring opening

polymerizations, polymerization by transition metal catalysts. Recent advances in polymer synthesis. Three lecture hours per week.

CHEM 6165. Advanced Biochemistry. (3) Prerequisite(s): CHEM 6101, BIOL 6102, BIOL 6103, BIOL 6104, or permission of instructor. Advanced course on protein structure, enzyme and mechanistic biochemistry, metabolic biochemistry, biophysical chemistry. Three lecture hours per week.

CHEM 6681. Research Seminar. (1) Prerequisite(s): Permission of instructor. Individual investigation and exposition of the results.

CHEM 6682. Research Seminar. (1) Prerequisite(s): Permission of instructor. Individual investigation and exposition of the results. *May be repeated for credit.*

CHEM 6900. Research and Thesis. (1 to 16) Prerequisite(s): Permission of instructor overseeing thesis research. Laboratory research for the thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

CHEM 8069. Topics in Biochemistry. (3) Prerequisite(s): CHEM 6165 or permission of instructor. Discussion of current topics in biochemistry emphasizing their biomedical/biotechnological aspects from a bioinorganic chemistry perspective, bioorganic chemistry, bioanalytical chemistry, biophysical chemistry, biocomputational chemistry, biomaterials. *May be repeated for credit.* Three lecture hours per week.

CHEM 8101. Biochemical Principles. (4) Prerequisite(s): Admission to Ph.D. program. Molecular biophysics of biological molecules. Bioenergetics of biological reactions and enzyme structure, mechanisms, and regulation. Metabolic pathways and the role of cellular organelles. Biochemical analysis methodology. Thirty-one two-hour lectures.

CHEM 8147. Molecular Photochemistry and Photophysics. (3) Prerequisite(s): Admission to graduate program or permission of instructor. An investigation of the excited states of organic molecules and the photophysics governing the transitions between these states both radiative and nonradiative. Topics include: electronic orbitals, absorption, emission, potential energy surfaces, energy transfer, photophysical radiationless transitions, singlet oxygen and chemiluminescent organic reactions. In this course each student will develop and demonstrate a photochemistry laboratory experiment that illustrates a principle or problem, or new direction of photochemistry. Three lecture hours per week.

CHEM 8155. Polymer Synthesis. (3) Prerequisite(s): Admission to Ph.D. program or permission of instructor. Polymer structure, classification of polymerization reactions, theory and practice of step growth polymerization, radical, ionic and ring opening polymerizations, polymerization by transition metal catalysts. Recent advances in polymer synthesis. Requires a "Research Proposal" which includes a presentation in class as well as a ten page prospectus style manuscript. Three lecture hours per week.

CHEM 8165. Advanced Biochemistry. (3) Prerequisite(s): CHEM 8101, BIOL 8102, BIOL 8103, and BIOL 8104. Advanced course on protein structure, enzyme and mechanistic biochemistry, metabolic biochemistry, biophysical chemistry. Three lecture hours per week.

Child and Family Development (CHFD)

CHFD 5100. Development: Prenatal to Pre-Adolescence. (3) Prerequisite(s): Admission in Teacher Education for Graduate Certificate in Teaching. The study of development (within the context of family, community, culture, and society) beginning at conception through adolescence. The potential influences of biological, genetic, and environmental factors on development are explored. Theories and research related to developmental processes are examined. A field-based clinical assignment of approximately 20 hours is required.

CHFD 5114. Collaboration with Diverse Families: Prenatal to 36 months. (3) Prerequisite(s): Admission to Graduate Certificate in Teaching. Examines and applies in-depth research, theory and practices to create and implement evidence-based supports that build upon family and child strengths in a variety of home and community settings. Relationship-based approaches will be embedded throughout the course content. Explores the influence of family and community on the development of infants and toddlers through 30 hours of field-based experience.

CHFD 5200. Child Life: Supporting Children and Families. (3) An overview of the Child Life field, introducing and examining concepts, principles, and applications for the Child Life profession. Students are introduced to the role of the Child Life Specialist in supporting ill children and their families to promote optimal coping and development. Includes site visits.

CHFD 5250. Assessment of Young Children. (3) Examines effective methods of observation, documentation, and assessment as related to developmental theory for young children, Birth-age 8. A field-based clinical experience is required.

CHFD 6000. Topics in Child and Family Development. (1 to 6) May include classroom and/or clinical experiences in the content area. *May be repeated for credit with permission of department.*

CHFD 6102. Learning and Development. (3) Prerequisite(s): Admission to the M.Ed. in Child and Family Studies or the M.A. in Counseling program. In-depth study of selected theories of learning and development.

CHFD 6110. Family-Professional Partnerships. (3) Prerequisite(s): Admission to Teacher Education, GPA of at least 2.5, CHFD 5100, and CHFD 5114. An examination of the principles and practices of family-professional partnerships in terms of research, program implementation, evaluation, and collaboration. Includes in-depth study of developmental designs, supportive programs designed to prevent problems, and programs and organizations which respond to family needs and interests. Emphasis is placed on the process of family involvement, communication, and collaborative leadership

CHFD 6115. Child and Family Advocacy. (3) Prerequisite(s): CHFD 6102. Study of the principles and practices of child and family advocacy.

CHFD 6120. Creativity, Learning Environments and Experiences. (3) Investigation of theories of creativity and their relationship to curriculum development.

CHFD 6200. Curriculum and Learning Environments for Young Children. (3) Prerequisite(s): CHFD 5100, and CHFD 6230. Examines theoretical and research foundations for designing, implementing, adapting, and evaluating curriculum that is responsive to the needs of young children across a range of early childhood settings and environments. Observational strategies are used to assess both the child (individual, sociocultural, and developmental characteristics) and the environment to identify best practices.

CHFD 6205. Integrated Instructional Applications in Child and Family Development. (3 or 6) Prerequisite(s): CHFD 5100, CHFD 5250, CHFD 6200, CHFD 6230. Acceptance into Graduate Certificate Program. Focuses on the integration of planning, implementing, and assessing instructional and environmental strategies for young children of differing abilities and their families across community settings. Students develop and apply knowledge of varied children's needs by planning and implementing lessons that align to state standards and edTPA competencies in developmental domains and academic content designed to meet the individual needs of all young children and their families. Additionally, students analyze child outcome data and make instructional decisions for subsequent planning. This is a

clinical intensive course requiring extensive classroom experience.

CHFD 6210. Inclusive Education for Young Children. (3) Pre- or Corequisite(s): CHFD 6102. Inclusive education provides the opportunity for children with and without developmental disabilities to learn together. Inclusive early childhood curricula and instructional strategies are emphasized as is the professional role of interdisciplinary team member. Legislative mandates for inclusion are studied.

CHFD 6220. Family Theory and Research. (3) Pre- or Corequisite(s): CHFD 6102. Study of family theories and research which employ the contextual framework of the family as a system and which explain family of origin, family functioning, family structure, and family process. Application of theory and research will include an understanding of the various levels of family functioning as a model for developing family support and intervention plans.

CHFD 6230. Emerging Literacy and Mathematical Understanding. (3) Prerequisite(s): Admission to Graduate Certificate in Teaching. Examines the development of language, literacy, and mathematical thinking in young children. Research, current educational practice, and instructional materials and strategies are analyzed. Emphasis is on the design and assessment of integrated listening, speaking, reading, writing, and mathematical activities.

CHFD 6240. Advanced Studies in Infant and Child Development. (3) Prerequisite(s): CHFD 6102. An advanced course to extend knowledge of prenatal, infant, and early years development of typically and atypically developing children. Developmental domains of infants and young children and their relationships within family and society are emphasized. IECMH Endorsement: This course partially addresses Competency Guidelines® and Infant and Early Childhood Mental Health Endorsement®.

CHFD 6300. Evidence-Based Practices in Child and Family Studies. (3) Prerequisite(s): Admission to the M.A.T. in Child and Family Studies: Early Childhood Education (B-K). Investigates evidence-based practice guidelines, methods, and outcomes in assessment, intervention, instruction, and evaluation outcomes and/or policies that support child development in the context of families and communities.

CHFD 6330. Action Research Development and Proposal. (3) Prerequisite(s): CHFD 6300. Corequisite(s): RSCH 6101. Introduces candidates to action research in the context of self-reflective inquiry in candidates' own practice with strategies to improve practice. Fundamentals of the action research process including theoretical context, methods of collecting, analyzing, and describing data to prepare

candidates to develop a proposal and conduct action research independently.

CHFD 6400. Student Teaching Seminar: B-K Child and Family Development. (6) Prerequisite(s): Approval of an Application for Student Teaching and departmental approval. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting. Includes seminars. Participating students pay a course registration fee for edTPA portfolio assessment. *Graded on a Pass/Unsatisfactory basis.*

CHFD 6800. Individual Study in Child and Family Studies. (1 to 6) Prerequisite(s): A written plan of study approved by the student's advisor and the individual study director. Designed to allow a student to pursue specialty interests under the supervision of an appropriate faculty member. Permission of the student's advisor and appropriate individual study director. *May be repeated for credit.*

CHFD 6900. Research in Child and Family Studies (Master's Thesis). (3) Prerequisite(s): RSCH 6101 and completion of at least 24 hours of graduate program. Design, implementation, presentation, and evaluation of an approved thesis in the student's specialty area. The thesis is of the student's own design under the supervision of an advisor and graduate committee. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

CHFD 7200. Leadership in Child and Family Studies. (3) Prerequisite(s): CHFD 6300, CHFD 6330, RSCH 6101, and completion of at least 24 credit hours of the graduate program. Corequisite(s): CHFD 7691. Review, compilation, analysis, and evaluation of the literature, research, and experiences relevant to the student's specialty area. Students demonstrate leadership by conducting a program evaluation, creating innovative solutions to challenges, and initiating and creating collaboration among persons and across agencies.

CHFD 7400. Applied Leadership in Child and Family Studies. (3) Prerequisite(s): Completion of at least 30 credit hours of graduate program. An intensive, professional supervised field-based experience in which students demonstrate the ability to provide direct service, to apply research and theory in a field-based setting, and to assume leadership roles. A minimum of 200 clock hours is required.

CHFD 7691. Project Implementation in Child and Family Studies. (2) Prerequisite(s): CHFD 6300, CHFD 6330, RSCH

6101; completion of at least 24 credit hours in the M.Ed. in Curriculum and Instruction; and committee-approved action research proposal. Corequisite(s): CHFD 7200. Focuses on the implementation and analysis of the approved action research proposal. Candidates demonstrate leadership by creating innovative solutions to challenges and initiating and creating collaboration among persons and within an agency that serves children and families.

Criminal Justice and Criminology (CJUS)

CJUS 5000. Topics in Criminal Justice and Criminology. (3) Specialized topics in criminal justice and criminology. *May be repeated for credit.*

CJUS 5101. Drugs, Crime, and the Criminal Justice System. (3) Provides an overview of the current state of drug use in this country and throughout the world and examines the nature and extent of drug use, the history of drug use/abuse, contemporary drug use patterns, licit and illicit drug dealing and trafficking, crime and violence associated with drug use and drug markets, drug control strategies at the local, state, national and international level, treatment level, treatment options and alternatives, drug policy issues, legalization debates, and prevention strategies.

CJUS 5103. International Criminal Justice. (3) Examination of the patterns and trends in international crime such as terrorism, transnational organized crime, and trafficking in people and a review of how the legal traditions of common law, civil law, Islamic law and socialist legal systems are structured and function criminal justice systems of the United States and other nations.

CJUS 5160. Victims and the Criminal Justice System. (3) Relationship between victims of crime and the criminal justice system. Specific topics include an analysis of the characteristics of crime victims, victim reporting patterns, treatment of victims by the various segments of the criminal justice system, victim assistance programs, and the issue of compensation and/or restitution for victims of crime.

CJUS 5161. Violence and the Violent Offender. (3) Issues surrounding violence in today's society and their impact on offenders involved in homicide, child and domestic abuse, and other forms of violence. Examination of myths about violence, victim-offender characteristics and relationships, and theories of violence.

CJUS 5162. Sexual Assault. (3) Comprehensive and critical examination of sexual exploitation in the United States.

CJUS 6000. Topics in Criminal Justice. (3 to 6) Specialized criminal justice topics. *May be repeated for credit.*

CJUS 6001. Topics in Crime Analytics. (3) Specialized topics in crime analytics. *May be repeated for credit with change of topic.*

CJUS 6101. Criminological Theory and Policy. (3) Definitions and patterns of criminal behavior. Major theoretical perspectives on crime, including historical, philosophical, individual, community-oriented and societal approaches. Particular focus on the development of policy and the effectiveness of current policies aimed at reducing crime.

CJUS 6102. Research Methods and Design. (3) Introduction to research methodology and statistics with emphasis on applications to criminal justice settings. Topics include: problem selection, theory, hypothesis formulation, research design, sampling, measurement, and proposal writing.

CJUS 6103. Quantitative Crime Analytics I. (3) Introduction to basic through advanced inferential statistics with an emphasis on criminal justice research. Topics include data input, data analysis, null hypothesis significance testing, regression with continuous and limited dependent variables, and statistical interpretation.

CJUS 6104. Legal and Ethical Issues in Crime Analysis. (3) Provides an overview of crime analysis from the perspective of culture (e.g., law, ethics, and governance). Particular attention is given to pre-crime control policy, information technology, and the surveillance state. Legal challenges (in criminal and constitutional law) and ethical concerns (for justice and the public good) are examined.

CJUS 6105. Criminal Justice Seminar. (1) An introduction to the criminal justice faculty, their research areas of expertise, and the type of projects with which they are currently involved.

CJUS 6106. Quantitative Crime Analytics II. (3)
Prerequisite(s): CJUS 6103 with a "B" or better. Introduction to the process of discovering and disseminating patterns of criminological data in order to improve the criminal justice system and the delivery of services in the system. Topics will cover current analytical approaches which may include: data mining, analysis of big data, geospatial analytics, and text analysis.

CJUS 6130. Law Enforcement Systems. (3) Consideration of the elements of law enforcement agencies as subsystems of the total criminal justice system. Comparisons of law enforcement systems in other countries is also considered.

CJUS 6131. Police Problems and Practices. (3) Research on current issues in law enforcement with emphasis on the legal, social, and institutional contexts in which they occur.

CJUS 6132. Legal Issues in Law Enforcement. (3) Law applicable to the functions of police administrators and line police officers including constitutional, statutory, judicial, and administrative law governing search and seizure, arrest, interrogation, use of force, jurisdiction, civil and criminal liability of administrators and officers, and the rights of officers and suspects.

CJUS 6140. Prosecution and Adjudication Processes. (3) Functions and powers of prosecutors, defense attorneys, judges and juries including plea bargaining and court procedure.

CJUS 6150. Corrections. (3) Functions of correctional agencies, principles of punishment and a historical analysis of correctional institutions and programs including prisons, jails, probation and parole systems.

CJUS 6151. Correctional Strategies: Rehabilitation and Reintegration. (3) Efforts to change offender behavior and to facilitate the development of offender- community linkages. Institutional classification and treatment strategies, pre-release and temporary release programs, innovative uses of probation and parole systems, community residential programs and new dispositional models; e.g., sentencing to community service and restitution.

CJUS 6152. Legal Issues in Corrections. (3) Major legal issues pertaining to corrections, including sentencing, probation, restitution, prisons, parole, pardon and restoration of rights with emphasis on legal issues often confronted by correctional administrators and probation and parole personnel.

CJUS 6160. Juvenile Justice Systems. (3) The process by which specific behaviors are identified as delinquent and the responses of the juvenile justice system to such behaviors. Laws dealing with the juvenile justice system, the historical development of the system, and the effectiveness of innovative responses to delinquency.

CJUS 6171. Geospatial Analytics and Crime. (3) Familiarizes students with ArcGIS software and the visualization of geographically oriented data. Students work through assignments and projects aimed at helping them understand how to think about a problem spatially and create maps and visualizations that help answer these problems. The final project connects them to outside agencies to help the agency better understand a problem with which they are dealing.

CJUS 6172. Intelligence Analysis. (3) Examines intelligence analysis at the Federal, State, and Local levels, and how analytic strategies can be employed to analyze quantitative and qualitative data of interest to those operating in the national security environment.

CJUS 6174. Data Visualization. (3) Students (1) learn basic visualization design principles; (2) identify and analyze misleading charts and visualization; (3) become proficient in using visualization techniques to effectively and efficiently present multivariate, temporal, text, geospatial, and hierarchical data; (4) create a poster presentation suitable for presentation at a research conference; and (5) create a poster presentation suitable for presentation at a community forum.

CJUS 6400. Graduate Internship. (3 or 6) Prerequisite(s): Permission of instructor. The internship provides information, guidance, and work experience in a core area/discipline of the criminal justice and related fields. It provides students with an opportunity to gain valuable work experience, make contacts with local agencies, and build their skill set. Students attain knowledge in professionalism, ethics, interviewing, and resume building. Finally, the course project includes the development and presentation of an original research project conducted in conjunction with the agency. *May be repeated for credit up to 6 credit hours.*

CJUS 6800. Directed Individual Study in Criminal Justice. (1 to 6) Supervised investigation of a criminal justice problem of special interest to the student. *May be repeated for credit one time with permission of student's major professor or academic committee.*

CJUS 6901. Thesis I. (3) Students work on developing a research proposal of a significant criminal justice topic approved by the student's thesis committee. The final proposal includes an extensive literature review and a detailed discussion of the research plan. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

CJUS 6902. Thesis II. (1 to 3) Prerequisite(s): CJUS 6901. Students conduct independent research developed in CJUS 6901, successfully defend the research in an oral defense meeting, and have the final written thesis approved by the graduate school. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

Construction and Facilities Management (CMET)

CMET 5000. Special Topics - Construction Management. (1 to 4) Cross-listed Course(s): CMET 4073. Prerequisite(s): Permission of department. A study of new and emerging

technical topics pertinent to the field of construction management. *May be repeated for credit.*

CMET 5126. Project Scheduling and Control. (3) Methods for planning, scheduling, and controlling construction projects, emphasizing manual and computer-based techniques for critical path method scheduling, resource management, construction cost control, and reporting practices.

CMET 5135. Building Information Modeling. (3) The creation, management, and application of building information models to the construction, operation, and maintenance of a facility. Focus on 3D and 4D computer models of building components, renderings, animations, and interfacing with analysis tools.

CMET 5140. Building Energy Management. (3)
Prerequisite(s): ETCE 3271, ETME 3143, or permission of instructor. Integrated planning of energy efficient technologies for building environmental control systems. Introduction to the design, planning, and optimization of HVAC systems and technology needed to integrate the heating, cooling, natural ventilation, lighting, electricity, and building energy management systems into a building's structure and design.

CMET 5150. Green Building (3) Sustainable design and construction. Topics include: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation in design, and regional priority.

CMET 5160. Advanced Construction Materials. (3)
Materials utilized in concrete, concrete construction, and quality control. Study of concrete properties and the variables that affect them. Topics also include: destructive and non-destructive testing of structural concrete, service life prediction models, and preventative measures, as well as recent advances in concrete materials, construction, and technology.

CMET 5290. Temporary Structures in Construction. (3)
Prerequisite(s): ETCE 3163 or permission of instructor. Temporary structures used to support construction operations such as concrete formwork, scaffolding systems, shoring systems, cofferdams, underpinning, slurry walls, and construction dewatering systems.

CMET 6000. Special Topics in Construction and Facility Management. (3) Study of specific new areas emerging in the various fields of construction and facility management. *May be repeated for credit.*

CMET 6135. Advanced Construction Planning and Management. (3) Prerequisite(s): CMET 4126 or permission of instructor. Advanced methods for planning and

controlling construction projects. Specific topics of study include resource allocation, leveling and management, critical path method (CPM) and project evaluation and review techniques (PERT) of scheduling, project controls through cost-schedule integration, and schedule compression.

CMET 6145. Facilities Management Financial Analysis. (3)
Prerequisite(s): ETGR 3222, ECON 2102, or permission of instructor. Real property concepts, issues, and topics pertinent to the facility management professional to include fundamentals of commercial real estate investment, understanding market influences, contracts and property portfolio management.

CMET 6160. Research and Analytical Methods. (3)
Prerequisite(s): STAT 1220 or permission of instructor. Analytical and research techniques applicable to construction and facility management problems. Topics of study include defining research problems, experiment design, measurement, sampling, and analysis.

CMET 6165. Transportation Asset Management. (3)
Management and planning techniques for transportation infrastructure assets. Focus on recent advances for maintaining and managing transportation assets, including performance management, prioritization of maintenance strategies, network and project level optimization.

CMET 6180. Alternative Project Delivery Methods. (3)
Prerequisite(s): CMET 3224 or permission of instructor. Study of the many organizational arrangements between construction owners, designers, contractors, and financiers. Delivery methods studied include design-bid-build (DBB), design-build (DB), construction management (agency CM and CM@Risk), design-build-operate (DBO), and design-build-finance-operate (DBFO).

CMET 6240. Safety and Risk Management. (3) Causes and prevention of industrial accidents, hazardous processes and material, OSHA regulations and requirements, and design of accident prevention programs.

CMET 6250. Asset Management for Facility Managers. (3)
Prerequisite(s): CMET 6270 or permission of instructor. Study of useful life of building and infrastructure systems and creating a process to manage their life cycles; emphasis on justifying and funding capital projects.

CMET 6255. Advanced Plant Layout and Design. (3)
Prerequisite(s): CMET 6270 or permission of instructor. Designing construction sites and facility plants with respect to material handling, equipment location, auxiliary services, capital requirements, safety, and personnel organization.

CMET 6270. Operation of Constructed Facilities. (3)
Acquisition, operation, maintenance, and disposal of

building systems, structures, permanent interiors, furniture, and equipment; grounds and other exterior elements.

CMET 6275. Advanced Construction Means and Methods.

(3) Construction means, methods, and equipment used to transform a particular design concept into a completed usable structure or facility. Emphasis is placed on current and innovative construction techniques and equipment.

CMET 6285. Quality Assurance in Construction. (3)

Prerequisite(s): CMET 6160 or permission of instructor. The principles and applications of quantitative methods of quality control to production processes with an introduction to process control charts, Pareto charts, and other quality analysis tools for the construction industry.

CMET 6800. Independent Study in Construction and Facility Management. (3)

Prerequisite(s): Permission of graduate committee advisor. Individual investigation and exposition of results for a directed project in construction and facility management. *May be repeated for credit.*

CMET 6900. Master's Thesis and Research. (1 to 6)

Prerequisite(s): permission of graduate committee advisor. Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

Arts + Architecture (COAA)

COAA 5600. Community Art Practices. (3) Survey of the theories and practices of activist, interventionist, public, participatory, and community-based art that operate within and across fields such as performance, urban studies, muralism, art education, public interest design, and other socially-engaged disciplines.

COAA 5601. History & Theory of Community Centered Art Practices. (3) Survey of the theories and practices of activist, interventionist, public, participatory, and community-based art that operate within and across fields such as performance, urban studies, muralism, art education, public interest design, and other socially-engaged disciplines.

COAA 5800. COAA Independent Study: Directed Investigations into Architecture, Art, Performance, or Design. (3) Prerequisite(s): Permission of the Graduate Program Director. Individual study and in-depth analysis in a special area related to the interests of a graduate student and the expertise of a faculty advisor. May count towards completion of concentration, track, or degree requirements if appropriate. *May be repeated for credit*

with change of topic and by approval of the student's Graduate Program Director.

COAA 5801. Interdisciplinary Study: Directed Investigations into Architecture, Art, Performance, and/or Design. (3 to 6)

Prerequisite(s): Permission of the Graduate Program Director. Directed interdisciplinary study in multiple topic areas related to the interests of a graduate student and the expertise of faculty advisors within the College of Arts + Architecture. May count towards completion of concentration, track, or degree requirements if appropriate. *May be repeated for credit with change of topic and by approval of the student's Graduate Program Director.*

COAA 5901. Independent Research and Capstone

Proposal in Community Centered Arts Practices. (3) Assists the student with the necessary knowledge and execution of a Capstone Project proposal in Community Centered Arts Practices. While the student is largely responsible for the path and discovery, the Research Advisor(s) will meet regularly with the student for guidance and insight into investigations to be developed into a capstone topic proposal within the realm of community-centered arts practices.

COAA 6901. Independent Capstone Project in Community Centered Arts Practices. (6)

Prerequisite(s): COAA 5901. Assists the student with the necessary knowledge and execution of an Independent Capstone Project in Community Centered Arts Practices. In this course, students will: define methods of community engagement; generate research and engagement parameters; identify disciplinary techniques; and establish the cultural and disciplinary frameworks for a significant cultural intervention in a specific place, community, or through a specific community-centered partnership. While the student is largely responsible for the path and discovery, the Research Advisor will meet regularly with the student for guidance and insight into the implementation of a capstone project within the realm of community-centered arts practices.

Communication Studies (COMM)

COMM 5141. Advanced Organizational Communication.

(3) Critical examination of the communication practices of organizations which accomplish such tasks as establishing organizational identification, influencing organizational members, and making decisions. Includes application of research methods to assess and analyze an organization's communication practices.

COMM 5147. International Public Relations. (3) Examines the complexities of public relations practice in an international setting. Includes overview of the factors that complicate communication across cultures and borders and an examination of the effect those factors have on public relations practice in specific global regions.

COMM 6000. Topics in Communication Studies. (3) Intensive investigation of a timely and important topic in communication studies. The topic of investigation may vary from semester to semester. *May be repeated for credit with permission of graduate advisor.* Topics courses include: Public Relations Issues Management, Public Relations Theory, Facilitating Corporate Social Responsibility, Integrated Communication, Sports & Rhetoric, and Fundraising.

COMM 6011. Topics in Communication Research Methods. (3) Prerequisite(s): COMM 6100 or permission of instructor. Focused and advanced instruction on a specific data analytic methodology relevant to communication studies. Sample foci may include—but are not limited to—focus groups, textual analysis, regression, interviewing, structural equation modeling, ethnographic analysis, hierarchical linear modeling. *May be repeated for credit with permission of graduate advisor.*

COMM 6100. Communication Research Methods. (3) Methods for systematic investigation of communication behavior. Theoretical and practical applications of both qualitative and quantitative research methodologies are utilized for completion of original projects.

COMM 6101. Contemporary Viewpoints in Communication Theory. (3) A survey of the leading theoretical traditions in communication studies. Covers both qualitative and quantitative approaches to conceptualizing communication practices.

COMM 6102. Professional Seminar in Communication. (3) Examination of the academic study of communication. Investigates the role of paradigms and use of the scholarly method. Students develop a scholarly project through a seminar approach.

COMM 6200. Communication Pedagogy. (3) Prerequisite(s): Communication Studies graduate students. Communication Pedagogy introduces graduate students to the theory and practice of instruction. Across the course, students will explore theories of learning and philosophies of education, as well as strategies, methods, and problems related to communication pedagogy. Students will also receive practical training and advice related to teaching at the college level, such as course design, methods of assessment, and classroom management techniques. Students will confirm their

understanding of pedagogy through teaching demonstrations.

COMM 6410. Professional Communication Studies Internship. (3, 6) Prerequisite(s): Enrollment in M.A. or Graduate Certificate in Communication Studies program. Students work 10 hours per week for 3 credit hours, or 20 hours per week for 6 credit hours in an approved placement. *May be repeated for credit in the same or a different internship placement with permission of Graduate Program Director. Graded on a Pass/Unsatisfactory basis.* Does not count toward the required 30 credit hours of graduate work for the M.A. degree or graduate certificate.

COMM 6880. Independent Study. (3) Prerequisite(s): Permission of instructor and Graduate Program Director. Area of study beyond the scope of current offerings to be devised by student and faculty member. *May be repeated for credit.*

COMM 6881. Communication Research Practicum. (3) Prerequisite(s): Communication Studies graduate students. Research Practicum provides students with practical, advanced experience with empirical research. Students will select a faculty supervisor who will work with them independently on an ongoing faculty-directed project. The primary goal of the practicum is to strengthen students' research methods skills and complement their theoretical knowledge by immersing them in different phases of the research process. As such, students will be involved in multiple aspects of the project (e.g., development of research questions, literature review, data collection, data analysis, interpretation of results, research report writing).

COMM 6995. Directed Project in Communication. (3 or 6) Design, implementation, presentation and evaluation of an approved applied research project in student's specialty area. The Directed Project is of the student's own design under the supervision of a research advisory committee. *May be repeated with permission of Graduate Program Director, if taken for three hours credit.* Six hours of Directed Project may be taken during a single semester.

COMM 6999. M.A. Thesis. (3 or 6) Appropriate research and written exposition of that research is required. The Thesis is proposed and defended under the supervision of a research advisory committee. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

Counseling (CSLG)

CSLG 6000. Topics in Counseling. (1 to 6) May include classroom and/or clinic experiences in the content area.

May be repeated for credit with permission of department.

CSLG 6100. Counseling Theories. (3) Examination of the counseling relationship from various theoretical frameworks, including client-centered, psychoanalytic, Gestalt, transactional analysis, rational emotive, reality, and behavior theories.

CSLG 6101. Ethical and Professional Issues in Counseling. (3) Ethical and legal responsibilities, ethical standards, interpretations of laws by local authorities, and court decisions that impact the counseling profession. Skills of practical, ethical, and legal consultation are also emphasized.

CSLG 6104. Counseling Across the Lifespan. (3) Examines major theories of human development across the lifespan from psychological, emotional, cognitive, physical, social and moral perspectives. In addition, a framework for understanding sociocultural, situational, environmental factors that impact individuals, families and communities is provided. Specific counseling methods and techniques that can be utilized in an integrated approach to help individuals and families address developmental challenges are integrated throughout the course.

CSLG 6109. Research in Counseling. (3) Examination of principles and practices for research and development of programs in counseling with emphasis on developmental designs, preventive programs, objectives and organizations.

CSLG 6110. Counseling Techniques. (3) Examination of concepts of individual counseling and the means for establishing facilitative relationships including competence in basic counseling skills and interventions.

CSLG 6111. Advanced Counseling Techniques. (3)
Prerequisite(s): CSLG 6100 and 6110. Counseling interventions useful in facilitating client change and growth from an action-oriented, problem management perspective. Strategies for cognitive, affective, and behavioral change will be practiced.

CSLG 6120. Group Counseling. (3) Prerequisite(s): CSLG 6110. Investigation of concepts of group counseling and the means for developing facilitative interaction in groups which includes an experiential component as a major learning activity.

CSLG 6121. The Leadership and Design of Structured Groups. (3) Methods of creating psychoeducational groups. Focus on applying psychological theories to the selection of group content. Leadership issues such as screening, dealing with difficult members, and leader roles are addressed.

CSLG 6145. Multicultural Counseling. (3) Multicultural perspectives are crucial to effective and ethical practice in the counseling profession. In this course, students develop the knowledge, skills, and awareness for multicultural and advocacy competence to help them be more effective in assisting diverse clients and supporting communities (especially at-risk and vulnerable populations).

CSLG 6150. Career Development and Counseling. (3) Designed to help counselors and/or career educators develop skills to use career theory and information with an emphasis on understanding individual lifestyle development, career education over the life span, and supportive career counseling.

CSLG 6153. Diagnosis and Treatment in Counseling. (3)
Cross-listed Course(s): CSLG 8153. Prerequisite(s): Graduate standing in M.A. in Counseling program. Developing diagnostic skills using the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) multiaxial classification system for mental and emotional disorders. Provides an overview of theory, research, and practice related to diagnosis and treatment.

CSLG 6154. Couples Counseling. (3) Surveys relevant theories of marriage and family therapy related to counseling couples. The major emphasis is on basic relationship processes, including healthy couple functioning, communication, developmental sequences, family of origin issues, intimacy, sexuality and conflict. Treatment planning and therapeutic strategies for specific couple problems such as divorce, marital affairs, and domestic violence are addressed. The objectives for this course are accomplished through assigned readings, seminar discussions, small group work, role plays, lectures, case presentations, audiovisual materials, guest speakers, and student assignments.

CSLG 6160. Theories of Addiction. (3) Introduction to the theoretical, philosophical, and historical premises upon which addiction is explained and treatment and prevention are based. Biological, psychological, and sociological etiologies of substance use and related addictive disorders are studied.

CSLG 6161. Assessment and Diagnosis of Addictive Disorders. (3) Process and procedures for professional biopsychosocial assessment and diagnosis of substance use and related addictive disorders in adolescents and adults. Implications of addiction for clients and their families are addressed.

CSLG 6162. Interventions in Addiction Counseling. (3) A counseling techniques course designed to help students who have worked as professional addiction counselors

and those who have little or no experience working with addicted individuals and their families.

CSLG 6163. Treatment Planning and Relapse Prevention in Addiction Counseling. (3) An introduction to the principles and practices upon which addiction treatment and relapse prevention are based. Students gain practical experience in assessment, diagnosis, treatment planning, and relapse prevention planning with addicted clients.

CSLG 6164. The McLeod Institute on Addiction. (3) Cross-listed Course(s): CSLG 8164. A hybrid course delivered through a combination of independent learning, self-directed study, attending the McLeod Institute on Addiction conference, and completing all required course assignments by end of Summer Session I. The McLeod Institute on Addiction is a conference offered annually during the third week in May. The topics vary yearly and are designed to provide both broad and specific knowledge germane to addiction counseling. *May be repeated for credit.*

CSLG 6200. Introduction to Theories of Family Counseling. (3) Examination of appropriate interventions in working with families focusing on major theorists and techniques in the field.

CSLG 6201. Counseling Needs of Women. (3) Women's development and needs, the problems they bring to counselors, strategies for helping with them, myths about women and biases in psychological research.

CSLG 6202. Counseling Military Families and Children. (3) Provides the opportunity to learn about the unique culture of military families and children. Specific challenges and stressors they encounter while serving in the U.S. Armed Forces are thoroughly addressed. Some of the topics explored include: characteristics of active duty personnel; National Guard and Reserve members; military children; stages of deployment; and various social, emotional, physical, and mental health concerns. Students completing this course also learn about evidence-based approaches and interventions, and develop a more in-depth understanding of how to work effectively with this specific population.

CSLG 6204. Counseling Military Veterans. (3) A comprehensive overview of issues impacting military veterans. Specific cultural factors such as race, gender, and sexual orientation are also taken into consideration. Topics include: career transitions, family matters, mental health stigma, traumatic brain injury, suicide, PTSD, depression, homelessness, and addiction. Resilience and strength of military veterans is also addressed. In addition, students learn about evidence-based techniques, strategies, and approaches utilized to work effectively with military veterans.

CSLG 6205. Counseling Older Adults. (3) Introduction to counseling adults over age 60 with a focus on positive aging. Explores characteristics of the older adult population and current issues and challenges they face (e.g., cultural considerations, developmental issues (cognitive, emotional, physical), mental health/substance abuse assessment, career and retirement concerns, spirituality, and dying, death, and bereavement). Recommended theoretical approaches to counseling older adults, including attendant techniques and interventions are examined.

CSLG 6800. Individual Study in Counseling. (1 to 6)
Prerequisite(s): Permission of the student's advisor.
Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

CSLG 7110. Individual Assessment. (3) Examination of the major aptitude, intelligence, and other psychological tests commonly used in counseling with emphasis on test theory as well as the administration, scoring, and interpretation of tests and the communication of their results.

CSLG 7140. Consultation in School Counseling. (3)
Introduction to the professional school counselor's role (K-12) in counseling, consulting, and coordinating school and community resources for the optimum benefit of the student.

CSLG 7141. The Professional School Counselor. (3) Cross-listed Course(s): CSLG 8141. An introduction to the profession of school counseling using the ASCA National Model as a basis for practice and program development. To support the school academic mission, students identify the necessary skills needed for the integration of various counseling activities that will include classroom guidance, individual and group counseling, consultation, program design, and coordinating school and community resources. Students also begin developing their professional School Counselor E-portfolio.

CSLG 7142. Introduction to Play Therapy. (3) Enhancing the counseling relationship with children by using play media to establish facilitative relationships with children under the age of ten years.

CSLG 7143. Child-Centered Relationship Training: An Approach for Parents/Caregivers/Teachers. (3)
Prerequisite(s): CSLG 7142. An advanced-level play therapy course that focuses on concepts and skills of filial therapy for training parents/caregivers/teachers to be therapeutic agents in their children's lives through child centered play therapy skills in regularly scheduled structured play sessions with children.

CSLG 7144. Contemporary Theories of Play Therapy. (3)

An advanced exploration of fundamental issues involved in play therapy, this seminar course focuses on an in-depth study of various theoretical approaches, modalities, techniques, and applications of play therapy. Historical and theoretical foundations of play therapy are presented as are current issues in providing appropriate counseling services to children aged three to ten years old.

CSLG 7145. Special Topics in Play Therapy. (3) Focuses on a variety of topics in play therapy such as conference, supervision of play therapy, and group play therapy. May be offered in alternative formats, such as weekend sessions and distance learning options.

CSLG 7146. Counseling Adolescents. (3) Cross-listed Course(s): CSLG 8146. Prerequisite(s): Graduate standing and permission of instructor. Focuses on counseling pre-adolescents and adolescents. Attention is given to the cognitive and socio-emotional development of pre-adolescents and adolescents, current issues affecting this population, ethical considerations when counseling this age group, and developmentally responsive counseling interventions.

CSLG 7147. Multicultural and Social Justice Issues in Play Therapy. (3) An advanced exploration of multicultural and social justice advocacy in play therapy. Focuses on self-awareness, knowledge, and skills relevant to providing culturally sensitive interventions to diverse children and their families. Topics include: racial and ethnic background, cultural heritage, family structure, religious and spiritual beliefs, disciplinary styles, adverse childhood experiences, and trauma informed interventions.

CSLG 7148. Expressive Arts Through the Lifespan. (3) The goal of the course is to enhance each student's knowledge of the rationale, procedures used as part of the counseling process, methods and techniques of expressive arts across the lifespan. Specifically, the focus is on the foundation of using expressive arts in play therapy and counseling by exploring the process, use and techniques of expressive arts for children, teens, and adults.

CSLG 7160. Solution-Focused Brief Therapy. (3)

Prerequisite(s): CSLG 6110, CSLG 6100, and CSLG 7430. An introduction to counseling in a time-limited manner while helping clients understand how they maintain their problems and how to construct solutions.

CSLG 7170. Introduction to Clinical Mental Health

Counseling. (3) Counseling in community agency settings, including the roles and functions of a professional counselor, assessing the needs of an agency population and the interworkings of various agencies and agency networks.

CSLG 7205. Techniques of Family Counseling. (3)

Prerequisite(s): CSLG 6100 and CSLG 6200. An overview of techniques used by family counselors working from communications, structural or strategic orientations.

CSLG 7430. Practicum in Counseling. (3) Prerequisite(s):

CSLG 6100, CSLG 6101, CSLG 6110, CSLG 6145, CSLG 7141 or CSLG 7170 if working with children age 10 and younger. Corequisite(s): CSLG 7142 may be taken as a co-requisite with CSLG 7430. Supervision of individual and group counseling interventions conducted in field setting; special attention to the development of the counseling relationship of evaluative criteria for self and peer assessment. A minimum of 10 hours per week is required in field experience. *Graded on a Pass/Unsatisfactory basis.*

CSLG 7435. Internship in Counseling. (3) Prerequisite(s):

CSLG 7430 and CSLG 7142 if working with children age 10 and younger. Students participate in delivering counseling services in a field setting and receive supervision of their work during weekly seminars. A minimum of 20 hours per week in field experience is required. *Graded on a Pass/Unsatisfactory basis.* This is a two semester internship and *May be repeated for credit.*

CSLG 7436. Advanced Internship in School Counseling. (3)

Offered specifically for students enrolled in the Post-Master's Certificate Program in School Counseling. A minimum of 20 hours per week in field placement is required and students have the opportunity to demonstrate advanced level skills in weekly seminars. *Graded on a Pass/Unsatisfactory basis.*

CSLG 7600. Human Sexuality in Clinical Practice. (3)

Candidates in the program will gain awareness, knowledge, and skills across a broad range of issues related to addressing human sexuality in the counseling relationship. An understanding of the diverse nature and construct of human sexuality is a focal point of this course. The course changes also aim for candidates to develop increased competence and comfort in exploring human sexuality, sexual expression and behavior, common problems in sexual functioning, and therapeutic interventions.

CSLG 7601. Counseling and Spirituality. (3) Incorporates the

spiritual dimension into the counseling process. It is specifically designed to help counselors understand their own spirituality and facilitate the inclusion of the spirituality of others with whom they provide counseling services. Spirituality is viewed as an important component to the achievement of mental health and to a balanced sense of wellness. Basic beliefs and various models spiritual development are examined.

CSLG 7646. Advocacy and Leadership in Professional School Counseling. (3) Developing effective leadership skills for school counselors with an emphasis on organization, planning, management, and evaluation of comprehensive school counseling programs based on the ASCA National Model. Developing skills in the utilization of data for systemic change and student success are detailed in individual student advocacy projects. Requires the completion of their professional School Counselor E-portfolio.

CSLG 7680. Crisis Counseling. (3) Focuses on a general crisis intervention model and its application to specific crisis situations. Topics include: suicide intervention, rape crisis, telephone counseling, and disaster intervention.

CSLG 7681. Grief and Loss Counseling. (3) Examines the theory of loss, the tasks involved in grieving, and the skills needed by a counselor working with grief and loss issues. Loss will be examined from a broad perspective and includes issues associated with death, loss of relationships, and loss of abilities.

CSLG 7682. Trauma Counseling. (3) An introduction to trauma for the counseling profession, where students are to demonstrate knowledge and skills related to the dynamics, symptoms, and current treatments/ techniques that support the counseling relationship. Students are to demonstrate expansion of their knowledge and skills related specifically to trauma within the counseling profession, and think critically about how they might approach clients who have experienced trauma in their work as counselors. Students will be presented with case scenarios and counseling approaches to try, discuss, and struggle through potential methods of handling each situation. Additionally, students will explore self-care skills to prevent burn-out and promote optimal care for clients.

CSLG 7800. Individual Study in Counseling. (1 to 6) Prerequisite(s): Permission of advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

CSLG 8000. Topics in Counseling. (1 to 6) May include classroom and/or clinic experiences in the content area. *May be repeated for credit with permission of department.*

CSLG 8100. Advanced Theories of Counseling. (3) The principles and practices of traditional and more current theories are examined. Students explore philosophical and psychological assumptions of the counseling theories and engage in critical thinking as they examine the rationale and consequences of their pre-conceived notions about conditions that influence human behavior and change.

CSLG 8105. Introduction to Counselor Education and Supervision. (3) Required in the first semester of doctoral study. An orientation for doctoral students about the doctoral program, doctoral culture, the counseling faculty, and current and emerging professional issues in counselor education and supervision. Students become familiar with CACREP standards and how they apply to counselor education. In addition, students have the opportunity to learn about the research trends in the field of counseling. Finally, the course addresses professional development as a scholar.

CSLG 8106. Advanced Multicultural Career Counseling. (1) Prerequisite(s): CSLG 6150 or equivalent, and CSLG 8345. Designed to help advance student's level of knowledge by examining the most recent career development theory and research practices. Provides knowledge and require students to use higher level critical thinking skills needed to enhance the quality of the career development interventions delivered to diverse populations in our global economy. Students should have completed an introductory course in career development and counseling before enrolling in this course. *Graded on a Pass/Unsatisfactory basis.*

CSLG 8107. Advanced Group Seminar (1). Prerequisite(s): CSLG 6120 or equivalent, and CSLG 8431. Enhance understanding of group theory and practice. Integrates advanced group theory with application of group leadership skills. Students develop counseling skills by providing leadership to small laboratory counseling groups. Group leadership skills are linked to theoretical stages of group development. *Graded on a Pass/Unsatisfactory basis.*

CSLG 8110. Clinical Supervision in Counseling. (3) A critical overview of the conceptual and empirical literature on counseling supervision, including models, approaches/techniques, relationship and process issues, and ethical and legal considerations. Students will develop conceptual knowledge, skills, and self-awareness concerning these topic areas through readings, seminar discussions, and application via supervising master's level students.

CSLG 8141. The Professional School Counselor. (3) Cross-listed Course(s): CSLG 7141. An introduction to the profession of school counseling using the ASCA National Model as a basis for practice and program development. To support the school academic mission, students identify the necessary skills needed for the integration of various counseling activities that will include classroom guidance, individual and group counseling, consultation, program design, and coordinating school and community resources. Students also begin developing their professional School Counselor E-portfolio.

CSLG 8146. Counseling Adolescents. (3) Cross-listed Course(s): CSLG 7146. Prerequisite(s): Graduate standing and permission of instructor. Focuses on counseling pre-adolescents and adolescents. Attention is given to the cognitive and socio-emotional development of pre-adolescents and adolescents, current issues affecting this population, ethical considerations when counseling this age group, and developmentally responsive counseling interventions.

CSLG 8153. Diagnosis and Treatment in Counseling. (3) Cross-listed Course(s): CSLG 6153. Prerequisite(s): Graduate standing in Ph.D. in Counselor Education and Supervision program. Developing diagnostic skills using the *Diagnostic and Statistical Manual of Mental Disorders (DSM-V)* multi-axial classification system for mental and emotional disorders. Provides an overview of theory, research, and practice related to diagnosis and treatment. Diagnostic criteria is studied with a sensitivity to cultural and ethnic issues.

CSLG 8160. Theories of Addiction. (3) Introduction to the theoretical, philosophical, and historical premises upon which addiction is explained and treatment and prevention are based. Biological, psychological, and sociological etiologies of substance use and related addictive disorders are studied.

CSLG 8161. Assessment and Diagnosis of Addictive Disorders. (3) Process and procedures for professional biopsychosocial assessment and diagnosis of substance use and related addictive disorders in adolescents and adults. Implications of addiction for clients and their families are addressed.

CSLG 8162. Interventions in Addiction Counseling. (3) A counseling techniques course designed to help students who have worked as professional addiction counselors and those who have little or no experience working with addicted individuals and their families.

CSLG 8163. Treatment Planning and Relapse Prevention in Addiction Counseling. (3) An introduction to the principles and practices upon which addiction treatment and relapse prevention are based. Students gain practical experience in assessment, diagnosis, treatment planning, and relapse prevention planning with addicted clients.

CSLG 8164. The McLeod Institute on Addiction. (3) Cross-listed Course(s): CSLG 8164. A hybrid course delivered through a combination of independent learning, self-directed study, attending the McLeod Institute on Addiction conference, and completing all required course assignments by end of Summer Session I. The McLeod Institute on Addiction is a conference offered annually during the third week in May. The topics vary yearly and are designed to provide both broad and specific

knowledge germane to addiction counseling. *May be repeated for credit.*

CSLG 8200. Introduction to Theories of Family Counseling. (3) Examination of appropriate interventions in working with families focusing on major theorists and techniques in the field.

CSLG 8201. Counseling Needs of Women. (3) Women's development and needs, the problems they bring to counselors, strategies for helping with them, myths about women and biases in psychological research.

CSLG 8203. Instructional Theory in Counselor Education. (3) Prepares students to become professors in counselor education. An examination of the theories and methods of teaching in higher education will be explored. Readings from professional journals, lecture, discussion, and practical application in the classroom are used to meet course objectives.

CSLG 8345. Advanced Multicultural Counseling. (3) An advanced exploration of fundamental issues involved in culturally competent counseling, this seminar course focuses on an in-depth study of various cultures seeking counseling services. Students examine various oppression models and have an opportunity to apply them to cultures in our community.

CSLG 8346. Applied Multicultural Counseling. (3) The impact of oppression on the daily lives of marginalized groups. Students conduct extensive field-based investigations into various cultures in order to gain mastery-level knowledge of the practical day-to-day experiences especially as they involve accessing mental health services. Special focus on counseling applications that are appropriate within and between cultures. Learning to utilize systems interventions and mastering the skills of consultation are key components of this course.

CSLG 8442. Doctoral Internship: Supervision. (3) Provides students with the practical experiences necessary to provide individual supervision of counselors, including field supervision and analyses of counseling audio and videotapes. Students have the opportunity to test their conceptual knowledge, skill, and self-awareness developed through prerequisite coursework. Students receive weekly individual/triadic supervision and regular weekly group supervision. A minimum of 200 clock hours is required. *Graded on a Pass/Unsatisfactory basis.*

CSLG 8431. Doctoral Practicum in Counseling. (3) Practicum is an applied course where students develop and/or refine their counseling skills. These skills will be conceptually linked counselor education and supervision. Working in sites throughout the community, students produce audio and/or video tapes of individual and group

counseling practice for supervision. *Graded on a Pass/Unsatisfactory basis.*

CSLG 8440. Doctoral Internship: Counseling. (3)

Prerequisite(s): CSLG 8100 and CSLG 8431. Students deliver counseling in a field setting and receive individual/triadic supervision and regular weekly group supervision. A minimum of 200 clock hours is required. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit with permission of department.*

CSLG 8443. Doctoral Internship: Research. (3)

Prerequisite(s): CSLG 8105. This course is designed to assist students in understanding how to conduct an empirical study in the counseling field and how to report their research findings. Students will take this course beginning in their second semester of doctoral studies. *Graded on a Pass/Unsatisfactory basis.*

CSLG 8445. Doctoral Internship: Teaching. (3) Students deliver teaching in counselor education in a field setting and receive weekly individual/triadic supervision and regular weekly group supervision. A minimum of 200 clock hours is required. *Graded on a Pass/Unsatisfactory basis.*

CSLG 8600. Sexual Orientation Diversity in Clinical Practice. (3) Considers the experience of being gay, lesbian, bisexual, or transgendered in our society. Theoretical understandings of sexual orientation are covered, as well as the impact of societal prejudice on gay, lesbian, bisexual and transgendered individuals and their communities. The experience of diversity with such communities is discussed, especially racial/ethnic diversity. Exploration of individual values combines with an emphasis on clinical practice to make this course relevant both personally and professionally.

CSLG 8601. Counseling and Spirituality. (3) Incorporates the spiritual dimension into the counseling process. It is specifically designed to help counselors understand their own spirituality and facilitate the inclusion of the spirituality of others with whom they provide counseling services. Spirituality is viewed as an important component to the achievement of mental health and to a balanced sense of wellness. Basic beliefs and various models spiritual development are examined.

CSLG 8680. Crisis Counseling. (3) Focuses on a general crisis intervention model and its application to specific crisis situations. Topics include: suicide intervention, rape crisis, telephone counseling, and disaster intervention.

CSLG 8681. Grief and Loss Counseling. (3) Examines the theory of loss, the tasks involved in grieving, and the skills needed by a counselor working with grief and loss issues. Loss will be examined from a broad perspective and

includes issues associated with death, loss of relationships, and loss of abilities.

CSLG 8800. Individual Study in Counseling. (1 to 6)

Prerequisite(s): permission of student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit. Graded on a Pass/Unsatisfactory basis.*

CSLG 8998. Seminar in Prospectus Design. (3) Provide students the opportunity to identify and define a research area of inquiry and develop a proposal draft for the dissertation study. Students will be expected to select, plan and outline an original research study appropriate for the dissertation requirement.

CSLG 8999. Dissertation. (1 to 9) Under the direction of a dissertation advisor and committee, students are expected to design and execute an original research study. This study should address a significant issue or problem related to counseling or counselor education. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term.*

Curriculum and Supervision (CUSU)

CUSU 8127. Comparative Higher Education. (3)

Prerequisite(s): Admission to the doctoral program in Educational Leadership or Curriculum and Instruction and advisor approval. Doctoral seminar study that compares international issues and developments in higher education in other countries with those in the United States. Topics include: historical development of the university, purpose of the university in different cultures, current expectations for faculty and students, and trends for the future. There will also be opportunity for students to pursue individual areas of interest.

Data Science and Business Analytics (DSBA)

DSBA 5122. Visual Analytics and Storytelling. (3) Cross-listed Course(s): HCIP 5122. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. The data science cycle includes many phases, including problem definition, data acquisition, data engineering, analysis, reporting, interpreting, visualization, and presentation of the results of analysis/insights derived. This course covers the last three steps in this sequence. It

introduces the field of visual analytics, which integrates interactive analytical methods and visualization, and utilizes this to build analytical stories that influence decision makers. Topics include: critical thinking, visual reasoning, perception/cognition, principles of interaction with an audience, building of visuals into a story to influence, and delivery of presentations whether in person or through video conferencing tools.

DSBA 6010. Special Topics in Data Science and Business Analytics. (3) Prerequisite(s): Enrollment in the M.S. or Graduate Certificate in Data Science and Business Analytics program. Specialized and contemporary topics of interest for students in the Data Science and Business Analytics program. Topics are chosen and covered to respond to the changes in the data science and analytics areas and to emerging needs of data science and analytics skills from employers. *May be repeated for credit with change in topic.*

DSBA 6100. Big Data Analytics for Competitive Advantage. (3) Cross-listed Course(s): HCIP 6103 and ITCS 6100. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. An introduction to the use of big data as a strategic resource. A focus is placed on integrating the knowledge of analytics tools with an understanding of how companies leverage data analytics to gain strategic advantage. A case approach is used to emphasize hands-on learning and a real-world view of big data analytics.

DSBA 6112. Graduate Econometrics. (3) Cross-listed Course(s): ECON 6112. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Advanced study of the theory and application of statistics to economic problems. Topics include: derivation of least-squares estimators; maximum likelihood estimation; and problems of multicollinearity, heteroskedasticity, and autocorrelation.

DSBA 6115. Statistical Learning with Big Data. (3) Cross-listed Course(s): STAT 6115. A survey of major statistical learning concepts and methods for big data analysis, including both supervised and unsupervised learning such as resampling methods, support vector machines, model selection and regularization, tree-based methods and ensembles, and statistical graphics. Students learn how and when to apply statistical learning techniques, their comparative strengths and weaknesses, and how to critically evaluate the performance of learning algorithms in case studies in financial investment, gene identification, and feature selection in high-dimensional spaces.

DSBA 6122. Decision Modeling and Analysis. (3) Cross-listed Course(s): MBAD 6122. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. An analytical approach to the

management process. Generalized models for decision making with major emphasis on application of the scientific method to management problems.

DSBA 6155. Knowledge-Based Systems. (3) Cross-listed Course(s): ITCS 6155. Prerequisite(s): ITCS 6162, full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Knowledge systems; knowledge discovery; association rules; action rules, hierarchical classifiers, cascade classifiers, query languages and their semantics; cooperative and collaborative systems; ontology and metadata; flexible query answering; chase algorithms and data sanitization methods; decision support systems in medicine; and automatic indexing of music.

DSBA 6156. Applied Machine Learning. (3) Prerequisite(s): DSBA 6201 or HCIP 6102, or permission of department. Cross-listed Course(s): HCIP 6156. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Practical perspectives and applications of machine learning methods and techniques including: acquisition of declarative knowledge; organization of knowledge into new, more effective representations; development of new skills through instruction and practice; and discovery of new facts and theories through observation and experimentation. Students are expected to have a functional knowledge of Python programming before enrolling in the course. Students are expected to have a functional knowledge of Python programming before enrolling in the course.

DSBA 6160. Database Systems for Data Scientists. (3) Cross-listed Course(s): HCIP 6160. Prerequisite(s): Full graduate standing and enrollment in M.S. or Graduate Certificate in Data Science program. The modeling, programming, integration, and provenance of big data. Focuses on SQL and NoSQL, but may also address other advanced topics. Topics include: (1) modeling/theory: basics of RDBMS and NoSQL, database design; (2) programming: SQL and NoSQL query languages; (3) integration: data warehousing, preprocessing; (4) databases in the Cloud; and (5) provenance: data version control, data lifecycle management.

DSBA 6162. Data Mining. (3) Cross-listed Course(s): HCIP 6162, ITCS 6162, and ITIS 6162. Prerequisite(s): DSBA 6160, Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Explores knowledge discovery and data mining algorithms for data analysis, with an emphasis on techniques suitable for large datasets. Topics to be covered include Data Operations (fusion, reduction, sanitization, balancing), Association/Representative Rules, Clustering, High Dimensional & Distributed Data Mining, Dimensionality Reduction, Link Analysis, and Actionability (Action and Meta-Action Rules). Students also examine a diverse range of data mining areas such as Mining Data Streams, Web

Mining, Web Advertising, Knowledge-Based Recommendation Systems, and Personalization. Throughout the course, a special focus will be placed on practical applications, showcasing diverse examples from fields like healthcare and business.

DSBA 6165. Artificial Intelligence and Deep Learning. (3)

Prerequisite(s): DSBA 6156. Introduces state-of-the-art methods in deep learning while setting a proper context for the growth of machine learning by providing an overview of the broader field of artificial intelligence (AI). Topics emphasize neural networks and deep learning architectures, but also include broader AI concepts such as knowledge representation, computer vision, as well as advanced learning methods such as transfer learning and reinforcement learning. Application of the deep learning methods to real world problems such as computer vision, natural language processing, and genomic analysis are examined both in class and in projects.

DSBA 6170. Ethics, Privacy, Security and Governance of Big Data. (3)

Provides data science graduate students with an overview of the challenges, theories, and solutions related to the ethics, security, privacy, and governance of big data. First examined are the most substantial ethical concerns that arise with big data, with attention to the ways that policies and technological developments can either ameliorate or increase them. Then contemporary methods and technologies are surveyed, as well as governance laws and policies that have been proposed or already deployed in the industry to ensure secure and proper handling of big data and analytical results. The course is team-taught by both experts in legal and ethical matters and experts in security and privacy technologies.

DSBA 6180. AI and Model Risk Management. (3)

Prerequisite(s): DSBA 6156 or DSBA 6211; Proficiency with Python is assumed. Surveys major risk elements in quantitative predictive modeling, covering basic steps and considerations in model development. Topics include performance measures, variable screening, transformation, and selection, with a focus on improving models to better control risks. Causality, over-fitting/under-fitting, interpretability, explainability, and sensitivity analysis are emphasized. Advanced methods such as LIME, SHAP, integrated gradients, and assessments of robustness, reliability, and fairness are also covered.

DSBA 6188. Text Mining and Information Retrieval. (3)

Cross-listed Course(s): ITIS 6188. Introduces the general computational techniques for analyzing large amounts of text data, as well as basic techniques for information retrieval. By introducing text mining (TM) and information retrieval (IR) in a unified framework, this course emphasizes the importance of integration of IR and TM needed to build the two major types of text information systems, i.e., search engines (such as Google, MS Bing,

etc.) and text analytics systems, for text information access and text analysis.

DSBA 6190. Cloud Computing for Data Analysis. (3)

Prerequisite(s): DSBA 6160 and DSBA 6156, or permission of instructor; proficiency with Python and/or R, SQL, Unix, data structures, machine learning algorithms, and statistics; good programming skills and a solid mathematical (linear algebra) background. Introduction to the basic principles of cloud computing for data analysis and data-intensive applications. Covers a broad range of technologies and solutions used in designing cloud-based data platform architectures and in performing analysis on massive data sets. Focuses on the scalable deployment of cloud resources and the integration between individual services. Topics covered will include the deployment and use of data architectures with data lakes and data warehouses, containerized applications, distributed computing using cluster technologies such as Apache Spark, machine learning, and deep learning using scalable/GPU-based infrastructure. Course may be taught on Microsoft Azure, Amazon Web Services, or another large enterprise cloud provider, depending on the instructor.

DSBA 6201. Business Intelligence and Analytics. (3)

Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. An overview of the business approach to identifying, modeling, retrieving, sharing, and evaluating an enterprise's data and knowledge assets. Focuses on the understanding of data and knowledge management, data warehousing, data mining (including rule-based systems, decision trees, neural networks, etc.), and other business intelligence concepts. Covers the organizational, technological and management perspectives.

DSBA 6207. Business Project Management. (3)

Cross-listed Course(s): MBAD 6207. Prerequisite(s): MBAD 5121 or equivalent; MBAD 6141; full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Project management is widely used in a variety of business environments to manage complex, non-routine endeavors. Examples of projects include consulting and process improvement projects, advertising projects, and technology projects. Focuses on tools, techniques, and skills for business project management, with attention to both the quantitative and the qualitative aspects of project management. Topics include: project evaluation, estimation, monitoring, risk management, audit, managing global projects, outsourcing, and project portfolio management. Students also gain experience using Project Management Software.

DSBA 6208. Supply Chain Management. (3)

Cross-listed Course(s): MBAD 6208. Prerequisite(s): MBAD 6141, full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Supply chain management

is concerned with all of the activities performed from the initial raw materials to the ultimate consumption of the finished product. From a broad perspective, the course is designed to examine the major aspects of the supply chain: the product flows; the information flows; and the relationships among supply chain participants. The course content is interdisciplinary in nature and covers a variety of topics such as supply chain information technologies, supply chain design, strategic alliances between supply chain participants and supply chain initiatives.

DSBA 6211. Advanced Business Analytics. (3) Cross-listed Course(s): MBAD 6211. Prerequisite(s): DSBA 6162 or DSBA 6201; full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. An in-depth study of applications of data analytics techniques to discover non-trivial relationships that are understandable, useful, and actionable to decision makers. A case approach is used to emphasize hands-on learning and real-world deployment of business analytics.

DSBA 6213. Applied Healthcare Business Analytics. (3) Cross-listed Course(s): HCIP 6213 and MBAD 6213. Prerequisite(s): Demonstrated proficiency with Microsoft Excel; STAT 5123, HADM 6108 (for students with background in healthcare administration), HCIP 6108 (for students with background in healthcare informatics), or equivalent. Focuses on applying business analytics within the healthcare setting. Students learn analytical tools used to synthesize big data into meaningful management information that is used in making key business decisions that impact the delivery of healthcare services. Case studies are utilized to prepare students for delivering boardroom level presentations of their findings.

DSBA 6276. Strategic Business Analytics. (3) Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Cross-listed Course(s): MBAD 6276. Develops and utilizes quantitative decision models to establish and implement marketing strategies. Ever-changing marketplaces are making an impact on the way business practitioners conduct their everyday operations. Given the business environment, using both quantitative and qualitative business data, students develop insights into practical business problems in various decision contexts ranging from consumer segmentation to market response models to new product development.

DSBA 6277. Social Media Marketing and Analytics. (3) Cross-listed Course(s): MBAD 6277. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. The utilization of social media in marketing strategy and tactics. Topics include: the use of social media in building brand strength and equity, as a customer acquisition tool, and as a customer relationship management tool. The utilization of analytics in effective social media marketing.

DSBA 6284. Digital Marketing Analytics. (3) Explores important techniques in marketing analytics with a focus on digital marketing applications. The primary purpose is to expose students with the essential data-analysis knowledge, methodologies, and hands-on experiences of analytical tools combined with lectures, discussions, and interactive communications to help students develop pragmatic problem-solving skills and learn to apply different tools in different decision-making settings. The course is structured on analyzing data through case studies and business applications either as homework/assignments or in-class hands-on exercises.

DSBA 6322. Complex Adaptive Systems. (3) Cross-listed Course(s): HCIP 6322, ITCS 6322, ITCS 8322, ITIS 6322 and ITIS 8322. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), nonlinear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. Covers those and similar topics in an interactive manner. Examples of our current research effort are provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity.

DSBA 6326. Network Science. (3) Cross-listed Course(s): HCIP 6326, ITIS 6326, ITIS 8326. Prerequisite(s): Full graduate standing and enrollment in the DSBA M.S. or Graduate Certificate program. Network Science helps students design faster, more resilient communication networks; revise infrastructure systems such as electrical power grids, telecommunications networks, and airline routes; model market dynamics; understand synchronization in biological systems; and analyze social interactions among people. It examines the various kinds of networks (regular, random, small-world, influence, scale-free, and social) and applies network processes and behaviors to emergence, epidemics, synchrony, and risk. This course integrates concepts across computer science, biology, physics, social network analysis, economics, and marketing.

DSBA 6345. Modern Data Science Systems. (3) Cross-listed Course(s): ITCS 6345. Prerequisite(s): DSBA 6156.

Advanced and recent techniques in data science, and their applications to business problems. Topics include: enterprise search and question answering, machine learning with neural networks, probabilistic and graph algorithms, and topological data analysis. Most assignments are done "in the cloud." The course assumes basic knowledge of data science exemplified by a graduate, undergraduate, or online machine learning course; a natural language processing course; as well as knowledge of elementary linear algebra, calculus, and statistics. Some experience with cloud computing is also expected.

DSBA 6390. Data Science and Business Analytics Project Practicum. (3). Prerequisite(s): DSBA 6160 and (DSBA 6156 or DSBA 6211); At least 15 credit hours of the core DSBA courses. Offers students a chance to tackle a semester-long project using skills acquired in the DSBA program. Projects address real industry problems, requiring students to understand business requirements, handle imperfect data, and work with stakeholders while planning, presenting, and implementing solutions. Each project will include machine learning models and may incorporate AI, following the entire model life cycle from inception to implementation. At semester's end, students will present their work through a live presentation and written report.

DSBA 6400. Internship. (3) Prerequisite(s): Completion of 18 credit hours of core course requirements. A data science or business analytics project is chosen and completed under the guidance of an industry partner. Each student's internship project program must be approved by the program director. A proposal form must be completed and approved prior to registration and the commencement of the internship. A mid-term report and a final report to be evaluated by the industry partner and supervising faculty. Grading is by the supervising faculty in consultation with off-campus supervisor at the internship organization. *Graded on a Pass/Unsatisfactory basis.*

DSBA 6991. Master Thesis Research. (1 to 5) Focused academic research resulting in the development, writing, and defense of a master's thesis. Must be taken over two or more semesters. *May be repeated for credit but no more than six hours may be applied to M.S. degree requirements. Variations in credit distribution across semesters are permissible (e.g., 1+5, 3+3, 2+2+2).*

Data Science (DTSC)

DTSC 8000. Special Topics in Data Science. (3) Prerequisite(s): DTSC 8110, DTSC 8120, DTSC 8130, DTSC 8140, DTSC 8600. Examination of major theories, methods, and issues in Data Science. Instructional method(s) vary according to topic, course objectives, and

instructor. *May be repeated for credit with change of topic.*

DTSC 8110. Statistics for Data Science. (3) Prerequisite(s): STAT 3160, STAT 4124 or STAT 5124; Intermediate competency in calculus is required; A college-level linear algebra course is recommended (or permission of the instructor). Fundamental statistical knowledge and examples solved with well-known statistical software in the context of data science. Topics include: probability distributions, data and statistical models, estimation approaches, confidence region and hypothesis testing, variance analysis and linear regression, logistic regression. The course is offered twice a week and has 3 graduate credits.

DTSC 8120. Fundamentals of Machine Learning. (3) Prerequisite(s): DTSC 8110 or permission by the program director/instructor. Foundational methods, mathematics, and algorithms needed to do research and applications in machine learning. Practical perspectives and applications of machine learning methods will be covered, including the development of new skills through instruction and practice; combined with an overview of the business to identify, model, retrieve, and evaluate enterprise data and knowledge assets. Focuses on the understanding of data and knowledge management and data mining using techniques such as Markov Decision Processes, Decision Trees, Supervised and Unsupervised Learning, Reinforcement Learning, Logistic Regression, and other business intelligence concepts. The course will discuss machine learning from organizational, technological, and management perspectives.

DTSC 8130. Ethics, Security, Privacy, & Governance of Data for Social Good. (3) Ethical, privacy and security concerns that arise in data science, with attention to the ways that governance policies and technological developments can either ameliorate or increase them. The course offers insights on the social impacts and potential benefits that data science and data scientists can provide to society.

DTSC 8140. Fundamentals of Artificial Intelligence. (3) Prerequisite(s): DTSC 8120; DTSC graduate student. Foundations of AI techniques and their applications in various real-world domains and how to implement a system with intelligent functionality. Students will learn to judge when intelligent functionality and AI may be a good solution for a problem and be able to choose suitable AI methods and techniques.

DTSC 8600. Research Design for Data Science. (2) The foundations of knowledge discovery and knowledge creation through data science. This comprises the discussion of the overall research process, research concepts, designs, and methodologies used in data

science, including scientific reasoning, the role of models and other forms of evidence-based knowledge creation such as experimental designs, deductive, inductive and abductive processes, and others. Lectures, readings, and discussions will teach how to ask pertinent questions, develop and apply relevant data-based research designs, interpret the world through the lens of data, and convey findings to diverse audiences.

DTSC 8601. Data Science Research Seminar. (1) Seminar introduction to the frontier of data science research in various domains of applications. It is structured with 3 to 4 modules through the semester, each one dedicated to a different body of literature. Students will gain research proficiency in the domains of application in focus during the semester. Topics will rotate with each offering. *May be repeated for credit with change of topic.*

DTSC 8800. Independent Study in Data Science. (1 to 4) Prerequisite(s): DTSC 8140, DTSC 8120, DTSC 8110, DTSC 8130. Individual research in specific topics of Data Science under the direction of a faculty member. *May be repeated for credit with change of topic up to maximum allowed by program.*

DTSC 8900. Dissertation Research. (1 to 9) Under the direction of a dissertation advisor and committee, students design and execute an original research study. This study should address a significant issue or problem within the field of Data Science. *May be repeated for credit to reflect research activities of the student.*

Electrical and Computer Engineering (ECGR)

ECGR 5090. Special Topics. (1 to 6) Directed study of current topics of special interest. *May be repeated for credit.*

ECGR 5100. Research Tools and Techniques in Computer Engineering. (3) Cross-listed Course(s): ECGR 4100. Prerequisite(s): Graduate standing. Introduces students to the fundamentals of computer engineering research and the practical tools required collect, analyze, and report research results. Key engineering mathematics topics are covered such as the propositional and predicate calculus, analysis of algorithms, and graph theory. Students are exposed to compiling software packages and device drivers as well as the conventions for developing similar software. Credit for ECGR 5100 will not be given where credit has been given for ECGR 4100.

ECGR 5101. Advanced Embedded Systems. (3) Cross-listed Course(s): ECGR 4101. Prerequisite(s): Graduate standing. An advanced course in embedded system design utilizing

advanced microprocessors. Architecture, software, and interface techniques. This course is project-oriented, involving the use of a logic analyzer and hardware design tools. Credit will not be given for ECGR 5101 where credit has been given for ECGR 4101.

ECGR 5102. Engineering Simulation. (3) A wide range of simulation related topics will be introduced including the theory of simulation, characteristics of simulators, and trade-offs in simulation studies. Continuous and discrete simulation with primary emphasis on application of simulation techniques to engineering problems. Simulation of actual problems based on students' interest and experience areas. Credit will not be given for ECGR 5102 where credit has been given for ECGR 4102.

ECGR 5103. Machine Vision, AI and Image Processing. (3) An introduction to the theory and application of perceptual machine learning, computer vision and digital image processing including applications in society such as computer vision, robotics, medicine, science, and public health, safety and welfare. Credit will not be given for ECGR 5103 where credit has been given for ECGR 4103.

ECGR 5104. Computational Methods in Power Systems. (3) Numerical techniques for analysis, operation and planning of power systems. Sparse matrix techniques applied to power flow algorithms. Economic operation of power systems. Optimum power flow. Credit will not be given for ECGR 5104 where credit has been given for ECGR 4104.

ECGR 5105. Introduction to Machine Learning. (3) Cross-listed Course(s): ECGR 4105. Machine learning is a sub-field of Artificial Intelligence that gives computers the ability to learn and/or act without being explicitly programmed. This course covers the necessary theory, principles, and algorithms for machine learning. Topics include: supervised, unsupervised learning approaches (including deep learning), optimization procedures, and statistical inference. Students digest and practice their knowledge and skills by class discussion, homework, and exams, as well as obtain in-depth experience with a particular topic through a final project.

ECGR 5106. Real-Time Machine Learning. (3) Cross-listed Course(s): ECGR 4106. Prerequisite(s): A background in programming is required. An interactive practical introduction to real-time machine learning and deep learning inference based on leveraging Nvidia Jetson platform. Introduces Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) inference algorithms for real-time computer vision and scene analysis, including object detection, pose estimation, and activity analysis. Examines basic deep learning constructs based on current design tools (e.g., Pytorch and Real-time Tensorflow libraries).

ECGR 5111. Control Systems. (3) Prerequisite(s): permission of instructor. Mathematical models and characteristics of control systems. Performance and stability of linear feedback systems. Root locus and frequency response techniques. Stability in frequency domain. Time domain analysis. Design and compensation of control systems. Credit will not be given for ECGR 5111 where credit has been given for ECGR 4111.

ECGR 5112. Nonlinear Analysis. (3) Solution of nonlinear problems using numerical and graphical methods, phase plane plots, analysis of singular points and analytical techniques. Forced oscillating systems. Stability of nonlinear systems. Use of analog and digital computer to study nonlinear problems.

ECGR 5115. Convex Optimization and AI Applications. (3) Cross-listed Course(s): ECGR 4115. This course focuses on the theory and the algorithmic aspects of convex optimization. Topics include convex sets, convex functions, and convex optimization problems; duality theory and optimality conditions; algorithms for solving convex problems; use of numerical tools to solve problems; and if time permits, we will discuss non-convex optimization problems. Throughout this course, we will discuss applications of the materials to engineering topics (as time permits) such as signal processing, control, robotics, machine learning, statistics, and related engineering problems. Credit will not be given for ECGR 5115 where credit has been given for ECGR 4115.

ECGR 5116. Artificial Intelligence for Biomedical Applications. (3) Prerequisite(s): ECGR 4105 or ECGR 5105. Cross-listed Course(s): ECGR 4116. Introduction to fundamental concepts of Artificial Intelligence (AI) and its application to biomedical domain. Exposure to pattern recognition, medical image processing, algorithms and machine learning frameworks using Python. Credit will not be given for ECGR 5116 where credit has been given for ECGR 4116.

ECGR 5117. AI for Robotics and Automation. (3) Cross-listed Course(s): ECGR 4117. Provides a working knowledge of foundational theory, algorithms and design used for creating autonomous robotic systems. The course also provides an understanding of how foundational algorithms in this area can be translated from a formal algorithmic implementation to a Deep Learning (DL) or Artificial Intelligence (AI) implementation. Credit will not be given for ECGR 5117 where credit has been given for ECGR 4117.

ECGR 5121. Antennas. (3) Radiation into free space, the point source, thin linear antenna, arrays of linear elements, aperture antennas, impedance, methods of feeding, matching and termination. Antenna systems. Credit will not

be given for ECGR 5121 where credit has been given for ECGR 4121.

ECGR 5122. Random Processes and Optimum Filtering. (3) Cross-listed as ECGR 5122. Review of probability, univariate and multivariate distribution functions; random processes, discrete and continuous time processes, wide-sense stationary, ergodicity; time- and frequency-domain analysis; linear systems, optimum filtering, Wiener filters, Kalman filters; application. Credit will not be given for ECGR 5122 where credit has been given for ECGR 4422.

ECGR 5123. Advanced Electromagnetic Field Theory. (3) Maxwell's equations and propagation. Properties of guided and surface waves. Wave properties of light; physical and fiber optics. Credit will not be given for ECGR 5123 where credit has been given for ECGR 4185.

ECGR 5124. Digital Signal Processing. (3) Sampling and signal recovery in linear systems; analysis of sampled systems; discrete and fast Fourier transforms; z-transform; discrete convolution; design of digital FIR and IIR filters. Credit will not be given for ECGR 5124 where credit has been given for ECGR 4124.

ECGR 5125. Foundation of Optical Engineering. (3) The engineering aspects and applications of modern optics, optical communications, optical materials, optical devices, basic optical fiber and integrated optics, optical signals, and optical modulation, multiplexing, and related networks, basic Fourier optics and its application in optical images and information. Credit will not be given for ECGR 5125 where credit has been given for ECGR 4125.

ECGR 5127. Machine Learning for the Internet of Things. (3) Cross-listed Course(s): ECGR 4127. Prerequisite(s): ECGR 5105. The concepts and skills necessary to design, train, and deploy machine learning models in resource-constrained devices are explored. Topics include: analysis of the computational requirements of machine learning models; requirements of edge-deployed machine learning; techniques to reduce storage, computation, and latency; and software tools available. The concepts are applied through a series of projects.

ECGR 5132. Analog Integrated Circuit Design. (3) Topics include: analog MOS modeling, design of current mirrors, references, and operational amplifiers. Both hand analysis and SPICE simulation utilized. Credit will not be given for ECGR 5132 where credit has been given for ECGR 4132.

ECGR 5133. VLSI Systems Design. (3) Analysis, design, and synthesis of very large scale integrated circuits. A project-oriented course relying heavily on computer-aided design tools for logic, layout design, and simulation. Credit will not

be given for ECGR 5133 where credit has been given for ECGR 4433.

ECGR 5134. Advanced VLSI Systems Design. (3)

Prerequisite(s): ECGR 5133 or permission of department. A project-oriented course dealing with advanced topics in VLSI systems design and analysis such as circuit design techniques, array structures, performance estimation, automated routing and device electronics. Credit will not be given for ECGR 5134 where credit has been given for ECGR 4188.

ECGR 5136. Semiconductor Optoelectronic Materials and Devices. (3) Direct and indirect bandgap materials; Compound and wide bandgap semiconductors; Electronic properties; Optical properties; Generation and recombination; Junction theory; Light emitting devices; Optical detectors. Credit will not be given for ECGR 5136 where credit has been given for ECGR 4136.

ECGR 5138. Electronic Thin Film Materials and Devices. (3)

Applications of thin films in microelectronics / optoelectronics manufacturing processes; vacuum technology, deposition techniques, and the characterization methods relevant to optoelectronic applications; thin film applications such as metallization, silicide formation, light emitting diodes (LED) and lasers, and doping of semiconductors. Credit will not be given for ECGR 5138 where credit has been given for ECGR 4138.

ECGR 5142. Power Generation: Operation and Control. (3)

Characteristics of power generation units, steam, nuclear reactor and hydroelectric. Economic and thermal system dispatch. Transmission losses, load flow problems. Hydro scheduling, hydro-plant models. Energy production cost models. Interchange evaluation. Credit will not be given for ECGR 5142 where credit has been given for ECGR 4190. (Fall) (Alternate years)

ECGR 5143. Dynamic and Transient Analysis of Power Systems. (3)

Large-scale systems state descriptions and hierarchical control. State space models, dynamic stability and testing. Stability of simple and multi-machine systems. Transient phenomena in electrical power systems. Transient stability problem. Credit will not be given for ECGR 5143 where credit has been given for ECGR 4191.

ECGR 5144. Power Electronics I. (3)

Prerequisite(s): Graduate standing and knowledge of fundamentals of electric circuit analysis and electronics, or permission of department. High power solid state circuits. Topics include: power transfer, DC/DC converters, DC/AC inverters for use in resonant converters and motor drives, AC/DC rectifiers, gate-drive circuits for linear and switching amplifiers, pulse-width modulators, introduction to power supply design correction Credit will not be given for ECGR 5144 where credit has been given for ECGR 4144.

ECGR 5146. Introduction to VHDL. (3)

Prerequisite(s): Knowledge of a computer language. Introduction to VHSIC Hardware Description Language (VHDL) including VHDL-based high-level design of microelectronic systems, VHDL programming, and VHDL synthesis; emphasis on learning and using industry-standard VHDL tools running on VNIIX workstations. Credit will not be given for ECGR 5146 where credit has been given for ECGR 4146.

ECGR 5161. Control of Robotic Manipulators. (3)

Control of industrial robots including linear, nonlinear, and adaptive control of robot's motion plus control of forces and torques exerted by the end-effector. Additional topics include computer animation of the controlled behavior of industrial robots, actuator and sensor types, robot vision, and control computer/robot interfacing. Credit will not be given for ECGR 5161 where credit has been given for ECGR 4162.

ECGR 5171. Introduction to Energy Systems. (3)

Prerequisite(s): Graduate standing or permission of the department. Overview of energy systems: energy types, generation, conversion, storage, transportation/transmission, and utilization. Principles, physical structure, processes, and utilization of fossil fuel, nuclear, and renewables for transportation, thermal, and electrical energy generation are discussed along with associated performance metrics. The course also provides an introduction to environmental impacts of energy production, life-cycle analysis, energy efficiency concepts and metrics, transmission systems, grid reliability, and the impact of smart grid technologies. All topics are presented in the context of industry standards as well as federal and state regulations. Credit will not be given for ECGR 5171 where credit has been given for ECGR 4171.

ECGR 5172. Energy Markets. (3)

Energy and power systems in regulated and competitive environments and implications on business decisions for firms in these industries. Topics include: mechanism of energy markets; comparative market systems; determination of prices under different market structures; gas, oil, coal, and electricity market architecture; electricity market design; dispatch and new build decisions; smart grid and renewable energy in electricity markets; risk and risk management in energy including demand and price volatility and use of financial derivatives; and the impact of financial market trends and current and proposed policies on the energy industry. Credit will not be given for ECGR 5172 where credit has been given for ECGR 4172.

ECGR 5181. Computer Architecture. (3)

Latest research and development in the area of computer architecture; multiprocessor architecture, multi-computers, interconnection networks, branch prediction, instruction-level, data-level and thread-level parallelism, and memory

hierarchy; high-performance machines and special purpose processors. Credit will not be given for ECGR 5181 where credit has been given for ECGR 4181.

ECGR 5187. Data Communications and Networking II. (3)

Prerequisite(s): Principles of data communication networks; computer communications network architecture (layering) with emphasis on the network layer, transport layer, and application layer; local area networks; medium access control; routing; data transport; Internet applications. Credit will not be given for ECGR 5187 where credit has been given for ECGR 4187.

ECGR 5189. Cloud Native Application Architecture. (3)

Prerequisite(s): Graduate standing. Cross-listed Course(s): ECGR 4189. Comprehensive introduction to architecting modern applications in the cloud that scale to millions of users. The course places equal emphasis on the basic principles of the different components and practices of cloud native architectures, and hands-on experience with industry standard tools.

ECGR 5190. Acoustics. (3) Vibrations and simple vibrating systems; radiating systems; plane waves of sound; dynamic analogies, microphones and other acoustic transducers; acoustic measurements. Credit will not be given for ECGR 5190 where credit has been given for ECGR 4122.

ECGR 5191. Analog and Digital Communication. (3) Analysis and transmission of signals, including analog communication systems (amplitude and frequency modulation); digital communications systems (pulse code modulation and data transmission systems). Credit will not be given for ECGR 5191 where credit has been given for ECGR 4123.

ECGR 5192. Solid State Microelectronic Devices. (3) Cross-listed Course(s): 5392. PN-junctions and Schottky junctions; bipolar and field effect transistors; optoelectronic and heterojunction devices; lithography and integrated circuits; microwave devices; light emitting devices and detectors; quantum devices using superlattices; quantum wells and quantum dots; material preparation and characterization; and measurement techniques. Credit will not be given for ECGR 5192 where credit has been given for ECGR 4134.

ECGR 5193. Power System Analysis I. (3) Representation of power system components for analysis studies. Transmission line parameters. Network equations. Load flow analysis and numerical methods. Credit will not be given for ECGR 5193 where credit has been given for ECGR 4141.

ECGR 5194. Power System Analysis II. (3) Economic operation of power systems. Short circuit studies. Symmetrical components. Transient stability analysis.

Credit will not be given for ECGR 5194 where credit has been given for ECGR 4142.

ECGR 5195. Electrical Machinery. (3) Advanced theory of transformers and rotating. Machines; harmonic and saturation effects on machine performance. Unbalanced operation and transient conditions. Credit will not be given for ECGR 5195 where credit has been given for ECGR 4143.

ECGR 5196. Introduction To Robotics. (3) Cross-listed Course(s): AEEE 5196, MEGR 4127. Modeling of industrial robots including homogeneous transformations, kinematics, velocities, static forces, dynamics, computer animation of dynamic models, motion trajectory planning, and introduction to vision, sensors and actuators. Credit will not be given for ECGR 5196 where credit has been given for either ECGR 4161 or MEGR 4127.

ECGR 5197. Optical Communication. (3) Overview of optical fiber, signal degradation in fiber, optical source, optical detectors, optical receiver, optical transmitter, optical network, signal processing, and signal distribution through DWDM and DWDDM. This course also addresses the recent topics in optical communication and optical signal. Credit will not be given for ECGR 5197 where credit has been given for ECGR 4186.

ECGR 5261. Microwave Circuit Design I. (3) Design and analysis of microwave devices and circuits; Telegrapher's and wave equations; physical transmission lines; circuit analysis techniques; impedance matching techniques; Wilkinson power dividers, hybrid couplers, transformers, and filters. Credit will not be given for ECGR 5261 where credit has been given for ECGR 4261.

ECGR 5265. Microwave Devices and Electronics. (3) Microwave transmission line theory, parameters, microwave waveguides, microstrip line and components including resonators, slow-wave structures, tees, rings, couplers, circulators, isolators, and microwave tubes. Microwave solid state electronics including microwave transistors, tunnel diodes, transferred electron devices, avalanche transit-time devices, and mono-lattice microwave integrated circuits. Credit will not be given for ECGR 5265 where credit has been given for ECGR 4265.

ECGR 5411. Control Systems Theory I. (3) Cross-listed Course(s): ECGR 4111. The fundamentals of modern multi-input-multi-output control systems and preliminary analysis of nonlinear systems via the method of linearization. Time domain analysis of control systems. Design of state-feedback controller via the method of pole-placements. Determining controllability and observability of linear systems. The design and compensation of control systems, Phase lead, lag controller synthesis, Nyquist Stability criterion and frequency domain responses. Credit will not

be given for ECGR 5411 where credit has been given for ECGR 4111.

ECGR 5412. Principles of Digital Control Systems. (3)

Prerequisite(s): Graduate standing. Introduction to digital control system principles including such topics as z-transform, Laplace transform, and starred transform analysis, pulse transfer functions, digital lag, digital lead, and digital PID controller design, closed-loop stability of digital control systems, and introduction to state-variable methods. Credit will not be given for ECGR 5412 where credit has been given for ECGR 4112.

ECGR 5431. Linear Integrated Electronics. (3) Design of linear integrated circuits utilizing bipolar and MOS devices. Application in linear amplifier design, control and processing of analog signals. Power supply regulators, analog switches, and active filters. Credit will not be given for ECGR 5431 where credit has been given for ECGR 4131.

ECGR 5892. Individualized Study. (1 to 6) Individual investigation and exposition of results. *May be repeated for credit.*

ECGR 6090. Special Topics. (1 to 6) Cross-listed Course(s): ECGR 8090. Directed study of current topics of special interest. *May be repeated for credit.*

ECGR 6104. Fabrication of Nanomaterials. (3) Cross-listed Course(s): ECGR 8104, MEGR 7104, and MEGR 8104. Prerequisite(s): NANO 8101 or permission of instructor. Lithographic methods (CVD, PVD, e-beam, ion beam, magnetron, evaporation, spin coating, mask fabrication, developing resists); microelectromechanical systems and nanoelectromechanical systems; limits of conventional mechanical processing, electroforming, growth mechanisms (organic, inorganic, thermal); powders. Credit will not be awarded for ECGR 6104 where credit has been awarded for ECGR 8104, MEGR 7104, or MEGR 8104.

ECGR 6111. Linear Systems Theory. (3) Cross-listed Course(s): ECGR 8111. Prerequisite(s): ECGR 4111 or equivalent with a grade of C or better; State space concepts and good understanding of linear algebra. Review of linear algebra, Linearization, LTI state-space models, matrix transfer functions, state equation solutions (uniqueness/existence), state transition matrices, stability criteria, observability, controllability, realizations, similarity transforms, canonical forms, state feedback by eigenvalue-placement, and observer design. Credit will not be given for ECGR 6111 where credit has been given for ECGR 8111.

ECGR 6112. Digital Control Systems. (3) Cross-listed Course(s): ECGR 8112. Prerequisite(s): ECGR 6111 or permission of instructor. Time-domain and Z-domain analysis of linear discrete systems, open and closed loop

sampled data systems, engineering characteristics of computer control systems, simulation of system dynamics. Credit will not be given for ECGR 6112 where credit has been given for ECGR 8112.

ECGR 6114. Digital Signal Processing II. (3) Cross-listed Course(s): ECGR 8114. Prerequisite(s): permission of department. Discrete Hilbert Transforms, discrete random signals, effect of finite register length in digital and signal processing, speech processing, radar and other applications. Credit will not be given for ECGR 6114 where credit has been given for ECGR 8114.

ECGR 6115. Optimal Control Theory. (3) Cross-listed Course(s): ECGR 8115. Prerequisite(s): ECGR 6111 or permission of instructor. Review of linear systems, optimal control problems in Lagrange and Mayer forms, Finite and infinite horizon Linear quadratic optimal control, Dynamic Programming and Hamilton-Jacobi-Bellman equations, calculus of variations and Pontryagin's optimality principle, advanced topics (e.g., stochastic optimal control, model predictive control). Credit will not be given for ECGR 6115 where credit has been given for ECGR 8115.

ECGR 6116. Foundations of Reinforcement Learning and Optimal Control (3) Cross-listed Course(s): ECGR 8116. Topics related to optimal control and reinforcement learning in model-based and model-free applications. Finite state machines, Shortest path problems, Dynamic programming, Models with uncertainties, Markov decision process, Dynamic Programming in stochastic settings, Optimal control problems, (Hamilton-Jacobi)-Bellman equation, Approximate dynamic programming, Reinforcement Learning algorithms (Q-learning, TD learning, SARSA), and applications of these concepts on real-world examples. Credit will not be given for ECGR 6116 where credit has been given for ECGR 8116.

ECGR 6117. Multivariable Controls. (3) Cross-listed Course(s): ECGR 8117. Prerequisite(s): ECGR 6111. Problem of robustness controls, emphasizing computer-oriented approaches; high infinity and algebraic methods current developments. Credit will not be given for ECGR 6117 where credit has been given for ECGR 8117.

ECGR 6118. Applied Digital Image Processing. (3) Cross-listed Course(s): ECGR 8118 and ITCS 6134. Digital image fundamentals; comparison of image transforms including Fourier, Walsh, Hadamard and Cosine; image data compression techniques; image enhancement algorithms; image restoration; image encoding process; image segmentation and description; relationship of hardware restrictions to image fidelity. Credit will not be given for ECGR 6118 where credit has been given for ECGR 8118.

ECGR 6119. Applied Artificial Intelligence. (3) Cross-listed Course(s): ECGR 8119. The theory of machine intelligence.

Computational methods for modeling machine intelligence including machine vision and automatic decision making from sensor measurements. Applications of this theory to autonomous robotic decision making such as navigation and industrial quality control. Credit will not be given for ECGR 6119 where credit has been given for ECGR 8119.

ECGR 6120. Wireless Communication and Networking. (3) Cross-listed Course(s): ECGR 8120. Prerequisite(s): Graduate standing. The cellular concept: interference issues, cell layout and planning, control techniques, grade-of-service and system capacity; characteristics of the mobile radio channel and channel models; multiple access techniques in wireless: FDMA, TDMA, and CDMA; analog and digital cellular telephone standards; packet radio systems: description, medium access control, and routing issues. Credit will not be given for ECGR 6120 where credit has been given for ECGR 8120.

ECGR 6121. Advanced Theory of Communications I. (3) Cross-listed Course(s): ECGR 8121. Prerequisite(s): introductory probability course or permission of department. Statistical communications theory and modern communications systems emphasizing modulation and methods of taking into account the effects of noise on various systems. Credit will not be given for ECGR 6121 where credit has been given for ECGR 8121.

ECGR 6126. Optimization for Machine Learning. (3) Cross-listed Course(s): ECGR 8126, ITCS 6116. An overview of optimization theory and its fundamental applications in machine learning systems. Scaling and complexity of algorithms used in machine learning and data science. Convex and non-convex optimization. First and second order methods. Distributed and federated learning. *Credit will not be given for ECGR 6126 where credit has been given for ECGR 8126.*

ECGR 6127. Medical Signal Processing. (3) Cross-listed Course(s): ECGR 8127. Fourier methods of medical signal processing. Physics of image formation for different medical imaging modalities including: planar x-ray, computerized tomography (CT), magnetic resonance imaging, and ultrasound. Signal processing techniques for image reconstruction, enhancement, and multimodal fusion. Credit will not be given ECGR 6127 where credit has been given for ECGR 8127.

ECGR 6132. Solid State Materials. (3) Cross-listed Course(s): ECGR 8132, OPTI 6371, OPTI 8371, and PHYS 6181. A review of semiconductor physics, bipolar and unipolar devices, photonic devices and methods of measuring specific device characteristics. Credit will not be given for ECGR 6132 where credit has been given for ECGR 8132.

ECGR 6138. Physical Design of VLSI Systems. (3) Cross-listed Course(s): ECGR 8138. Prerequisite(s): ECGR 5133 or

equivalent. Synthesis and design of high-speed VLSI circuits; state-of-the-art approaches for circuit simulation; models and techniques for VLSI physical design. Credit will not be given for ECGR 6138 where credit has been given for ECGR 8138.

ECGR 6141. Power System Relaying. (3) Cross-listed Course(s): ECGR 8141. Prerequisite(s): ECGR 4141 or permission of department. Function and principles of protective relaying instrument transformers. Directional, distance and differential relays. Protection of generators, transformers, and transmission lines. Ground fault protection. Computer relaying, algorithms for protective relaying. Credit will not be given for ECGR 6141 where credit has been given for ECGR 8141.

ECGR 6143. Power System Control. (3) Cross-listed Course(s): ECGR 8143. Computer functions for automatic control of power systems. Automatic generation control, regulation of frequency and tie-line power interchanges. Automatic voltage regulation, excitation system model. Power system dynamics. Computer control centers. Credit will not be given for ECGR 6143 where credit has been given for ECGR 8143.

ECGR 6144. Electric Power Distribution Systems I. (3) Cross-listed Course(s): ECGR 8144. Prerequisite(s): Graduate standing and knowledge of fundamentals of power systems, or permission from the department. The fundamental principles of the electric power delivery system with emphasis on distribution systems. Examines three-phase unbalanced system and component models, distribution power flow analysis, and radial power flow techniques. Credit will not be given for ECGR 6144 where credit has been given for ECGR 8144.

ECGR 6145. Electric Power Distribution Systems II. (3) Cross-listed Course(s): ECGR 8145. Prerequisite(s): Graduate standing, knowledge of fundamentals of power systems, and ECGR 6144 or ECGR 8144; or permission of department. Focuses on distribution automation and optimization methods applied to distribution systems operation and planning. Credit will not be given for ECGR 6145 where credit has been given for ECGR 8145.

ECGR 6146. Advanced VHDL. (3) Cross-listed Course(s): ECGR 8146. Prerequisite(s): ECGR 5146 or permission of department. Continuation of ECGR 5146. FPGA design with VHDL; VHDL modeling libraries and techniques, and VHDL coding methodology for efficient synthesized. Credit will not be given for ECGR 6146 where credit has been given for ECGR 8146.

ECGR 6147. Power System Stability and Control. (3) Cross-listed Course(s): ECGR 8147. Prerequisite(s): Graduate standing and knowledge of fundamentals of power systems, or permission of department. The fundamental

principles of power system stability with emphasis on modern power grid. Examines various power system stability analyses starting from small signal stability, transient stability, voltage stability, and frequency stability. System dynamics based on various stability conditions and controller design are also discussed. Credit will not be given for ECGR 6147 where credit has been given for ECGR 8147.

ECGR 6165. Information Theory. (3) Cross-listed Course(s): ITCS 6165. Information measures and their properties; entropy, relative entropy and mutual information. Information source models. Lossless data compression: the Kraft inequality, Shannon-Fano and Huffman codes. Typical sequences, asymptotic equipartition property, source coding theorem. Discrete memoryless channels: capacity, channel coding theorem. The additive Gaussian channel. Source coding under a fidelity constraint: rate distortion function and rate distortion theorem. Modern applications of information theory, including information security, data privacy and machine learning. Credit will not be given for ECGR 6165 where credit has been given for ECGR 8165.

ECGR 6173. Power Quality. (3) Cross-listed Course(s): ECGR 8173. Prerequisite(s): ECGR 5193 or equivalent. Definitions of power quality, types of power quality problems; sources of sags, transient overvoltages and harmonics; distribution overcurrent protection methods and their effect on power quality and reliability; harmonic analysis, principles of controlling harmonics, devices for filtering harmonics; power quality improvement methods. Credit will not be given for ECGR 6173 where credit has been given for ECGR 8173.

ECGR 6181. Embedded Operating Systems. (3) Cross-listed Course(s): ECGR 8181. Pre-/Corequisite(s): ECGR 5101 and graduate standing. Introduction to the fundamentals of embedded operating systems with an emphasis on real-time performance. A series of labs provides students practical experience on bare metal programming, embedded Linux kernel configuration and initialization, boot loaders, kernel modules, device drivers, and interrupt handlers.

ECGR 6182. Advanced Embedded Operating Systems. (3) Cross-listed Course(s): ECGR 8182. Prerequisite(s): ECGR 6181. An advanced course in embedded operating systems. Lectures cover multiple advanced topics in operating systems. Labs involve developing code for different components of a fully functional operating system kernel. Credit will not be given for ECGR 6182 where credit has been given for ECGR 8182.

ECGR 6183. Multiprocessor Systems Design. (3) Cross-listed Course(s): ECGR 8183. Prerequisite(s): Permission of instructor. Topics include: applications of multiprocessors

to digital systems design; hardware/software tradeoff considerations; master/slave, multiple/master and loosely coupled systems; data handling and synchronization problems, networking. Credit will not be given for ECGR 6183 where credit has been given for ECGR 8183.

ECGR 6184. Computer System Engineering. (3) Cross-listed Course(s): ECGR 8184. Topics include: data formats, register transfer operations, computer organization, microprogram control and ALU design. Arithmetic algorithms, I/O organization and memory organization are also covered. Specific emphasis is placed throughout on tradeoffs between hardware and software. Credit will not be given for ECGR 6184 where credit has been given for ECGR 8184.

ECGR 6185. Embedded Commercial Product Design. (3) Cross-listed Course(s): ECGR 8185. Prerequisite(s): ECGR 5101. An advanced course in embedded system design emphasizing the development of hardware sub-systems and software to create commercial products. Architecture, software, and interface techniques. This course is project-oriented, involving the use of software and hardware design tools. Credit will not be given for ECGR 6185 where credit has been given for ECGR 8185.

ECGR 6187. Modeling and Analysis of Communication Networks. (3) Cross-listed Course(s): ECGR 8187. Prerequisite(s): Probability theory or permission of department. Communication networks; application of analytical tools for modeling and performance evaluation of these networks, including stochastic processes, Markov models, queuing theory, and teletraffic theory. Credit will not be given for ECGR 6187 where credit has been given for ECGR 8187.

ECGR 6188. Fundamentals of Wireless Systems and Protocols. (3) Cross-listed Course(s): ECGR 8188. Prerequisite(s): Graduate standing and a prior course in data communications or computer networks. Provides an overview of different wireless and mobile network standards and systems. Covers the distinct characteristics of these wireless systems that require a fundamental redesign of protocols at layer 2 to layer 4 of the network protocol stack. Protocols for medium access control, routing, and reliable transport, in addition to middleware and applications custom-made for wireless networks will be dealt with. Credit will not be given for ECGR 6188 where credit has been given for ECGR 8188.

ECGR 6189. Wireless Sensor Networks. (3) Cross-listed Course(s): ECGR 8189. Prerequisite(s): Graduate standing and knowledge of (a) fundamentals of computer networking, (b) probability and random variables, and (c) C/C++ programming, or permission from the department. Provides the fundamental principles of wireless sensor networks with emphasis on networking protocols and

information processing aspects. Reviews basic principles of multi-hop wireless networks and discuss the specific design challenges for the development of networking protocols and applications with wireless sensors. Students go through hands-on tutorials and design projects with programmable wireless sensors. Credit will not be given for ECGR 6189 where credit has been given for ECGR 8189.

ECGR 6190. Smart Grid: Characteristics, Design, and Analysis. (3) Cross-listed Course(s): ECGR 8190.

Prerequisite(s): Graduate standing and knowledge of fundamentals of power systems, or permission from the department. The fundamental principles of the Smart Grid with emphasis on Grid modernization Analysis and design. Examines the design and integration of renewable energy resources to power grid, the impact of power system analysis in the context of smart grid, smart grid observability and controllability, Wide Area Monitoring and Control, Self-Healing network. Credit will not be given for ECGR 6190 where credit has been given for ECGR 8190.

ECGR 6197. Power Electronics II. (3) Cross-listed Course(s): ECGR 8197. Prerequisite(s): Graduate standing, knowledge of fundamentals of power electronics and basics of semiconductor physics, and ECGR 5144, or permission of department. Focuses on more advanced topics in power electronics. Topics include: converter modeling and control, advanced concepts in magnetic circuit design, gate and base drives, switching losses, resonant converters, zero-voltage and zero-current switching, utility-interfaced applications including FACTS, maximum power-point tracking, and power factor correction. Credit will not be given for ECGR 6197 where credit has been given for ECGR 8197.

ECGR 6264. Radio Frequency Design. (3) Cross-listed Course(s): ECGR 8264. Prerequisite(s): permission of instructor. Design and analysis of radio frequency circuits and systems including S-parameters, impedance matching, noise, intermodulation distortion, image rejection, cascade analysis, and incorporation of these methods in the design of modern radio receivers and transmitters. Credit will not be given for ECGR 6264 where credit has been given for ECGR 8264.

ECGR 6890. Individualized Study and Projects. (1 to 6) Individual investigation and exposition of results. *May be repeated for credit.*

ECGR 6990. Industrial Internship. (1 to 3) Prerequisite(s): Completion of nine hours of graduate coursework. Full- or part-time academic year internship in engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by their

graduate program director. Requires a mid-term report and final report to be graded by the supervising faculty.

ECGR 6991. Graduate Master Thesis Research. (0 to 6) Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

ECGR 8090. Special Topics. (1 to 6) Cross-listed Course(s): ECGR 6090. Directed study of current topics of special interest. *May be repeated for credit.*

ECGR 8104. Fabrication of Nanomaterials. (3) Cross-listed Course(s): ECGR 6104, MEGR 7104, and MEGR 8104. Prerequisite(s): NANO 8101 or permission of instructor. Lithographic methods (CVD, PVD, e-beam, ion beam, magnetron, evaporation, spin coating, mask fabrication, developing resists); microelectromechanical systems and nanoelectromechanical systems; limits of conventional mechanical processing, electroforming, growth mechanisms (organic, inorganic, thermal); powders. Credit will not be awarded for ECGR 8104 where credit has been awarded for ECGR 6104, MEGR 7104, or MEGR 8104.

ECGR 8111. Linear Systems Theory. (3) Prerequisite(s): State space concepts and good understanding of linear algebra. Review of linear algebra, Linearization, LTI state-space models, matrix transfer functions, state equation solutions (uniqueness/existence), state transition matrices, stability criteria, observability, controllability, realizations, similarity transforms, canonical forms, state feedback by eigenvalue-placement, and observer design. Credit will not be given for ECGR 8111 where credit has been given for ECGR 6111.

ECGR 8112. Digital Control Systems. (3) Cross-listed Course(s): ECGR 6112. Prerequisite(s): ECGR 6111, ECGR 8111, or permission of instructor. Time-domain and Z-domain analysis of linear discrete systems, open and closed loop sampled data systems, engineering characteristics of computer control systems, simulation of system dynamics. Credit will not be given for ECGR 8112 where credit has been given for ECGR 6112.

ECGR 8114. Digital Signal Processing II. (3) Cross-listed Course(s): ECGR 6114. Prerequisite(s): Permission of department. Discrete Hilbert Transforms, discrete random signals, effect of finite register length in digital and signal processing, speech processing, radar and other applications. Credit will not be given for ECGR 8114 where credit has been given for ECGR 6114.

ECGR 8115. Optimal Control Theory. (3) Cross-listed Course(s): ECGR 6115. Prerequisite(s): ECGR 8111 or permission of instructor. Review of linear systems, optimal control problems in Lagrange and Mayer forms, Finite and

infinite horizon Linear quadratic optimal control, Dynamic Programming and Hamilton-Jacobi-Bellman equations, calculus of variations and Pontryagin's optimality principle, advanced topics (e.g., stochastic optimal control, model predictive control). Credit will not be given for ECGR 8115 where credit has been given for ECGR 6115.

ECGR 8116. Foundations of Reinforcement Learning and Optimal Control. (3) Cross-listed Course(s): ECGR 6116. Topics related to optimal control and reinforcement learning in model-based and model-free applications. Finite state machines, Shortest path problems, Dynamic programming, Models with uncertainties, Markov decision process, Dynamic Programming in stochastic settings, Optimal control problems, (Hamilton-Jacobi)-Bellman equation, Approximate dynamic programming, Reinforcement Learning algorithms (Q-learning, TD learning, SARSA), and applications of these concepts on real-world examples. Credit will not be given for ECGR 8116 where credit has been given for ECGR 6116.

ECGR 8117. Multivariable Controls. (3) Cross-listed Course(s): ECGR 6117. Prerequisite(s): ECGR 6111 or ECGR 8111. Problem of robustness controls, emphasizing computer-oriented approaches; high infinity and algebraic methods current developments. Credit will not be given for ECGR 8117 where credit has been given for ECGR 6117.

ECGR 8118. Applied Digital Image Processing. (3) Cross-listed Course(s): ECGR 6118 and ITCS 6134. Digital image fundamentals; comparison of image transforms including Fourier, Walsh, Hadamard and Cosine; image data compression techniques; image enhancement algorithms; image restoration; image encoding process; image segmentation and description; relationship of hardware restrictions to image fidelity. Credit will not be given for ECGR 8118 where credit has been given for ECGR 6118.

ECGR 8119. Applied Artificial Intelligence. (3) Cross-listed Course(s): ECGR 6119. The theory of machine intelligence. Computational methods for modeling machine intelligence including machine vision and automatic decision making from sensor measurements. Applications of this theory to autonomous robotic decision making such as navigation and industrial quality control. Credit will not be given for ECGR 8119 where credit has been given for ECGR 6119.

ECGR 8120. Wireless Communication and Networking. (3) Cross-listed Course(s): ECGR 6120. Prerequisite(s): Graduate standing. The cellular concept: interference issues, cell layout and planning, control techniques, grade-of-service and system capacity; characteristics of the mobile radio channel and channel models; multiple access techniques in wireless: FDMA, TDMA, and CDMA; analog and digital cellular telephone standards; packet radio systems: description, medium access control, and routing issues.

Credit will not be given for ECGR 8120 where credit has been given for ECGR 6120.

ECGR 8121. Advanced Theory of Communications I. (3) Cross-listed Course(s): ECGR 6121. Prerequisite(s): introductory probability course or permission of department. Statistical communications theory and modern communications systems emphasizing modulation and methods of taking into account the effects of noise on various systems. Credit will not be given for ECGR 8121 where credit has been given for ECGR 6121.

ECGR 8126. Optimization for Machine Learning. (3) Cross-listed Course(s): ITCS 8116. An overview of optimization theory and its fundamental applications in machine learning systems. Scaling and complexity of algorithms used in machine learning and data science. Convex and non-convex optimization. First and second order methods. Distributed and federated learning. *Credit will not be given for ECGR 8126 where credit has been given for ECGR 6126.*

ECGR 8127. Medical Signal Processing. (3) Cross-listed Course(s): ECGR 6127. Fourier methods of medical signal processing. Physics of image formation for different medical imaging modalities including: planar x-ray, computerized tomography (CT), magnetic resonance imaging, and ultrasound. Signal processing techniques for image reconstruction, enhancement, and multimodal fusion. Credit will not be given for ECGR 8127 where credit has been given for ECGR 6127.

ECGR 8132. Solid State Materials. (3) Cross-listed Course(s): ECGR 6132, OPTI 6371, OPTI 8371, and PHYS 6181. The materials covered can be roughly divided into two parts: (I) the basic knowledge of solid state physics: Crystal Structure, Wave Diffraction and the Reciprocal Lattice, Crystal Binding and Elastic Constants, Phonons, Free Electron Fermi Gas, Energy Bands, Semiconductor Crystals, Fermi Surfaces and Metals (approximately the materials of Chapters 1-9 of Kittel's book); (II) Selected application topics: such as Plasmons, Polaritons, and Polarons, Optical Processes and Exciton, Dielectrics and Ferroelectrics, Surface and Interface Physics, Nanostructures (approximately the materials of Chapters 14-18 of Kittel's book). The materials may be supplemented with and replaced by those from other sources. Credit will not be given for ECGR 8132 where credit has been given for ECGR 6132.

ECGR 8138. Physical Design of VLSI Systems. (3) Cross-listed Course(s): ECGR 6138. Prerequisite(s): ECGR 5133 or equivalent. Synthesis and design of high-speed VLSI circuits; state-of-the-art approaches for circuit simulation; models and techniques for VLSI physical design. Credit will not be given for ECGR 8138 where credit has been given for ECGR 6138.

ECGR 8141. Power System Relaying. (3) Cross-listed Course(s): ECGR 6141. Prerequisite(s): Permission of department. Function and principles of protective relaying instrument transformers. Directional, distance and differential relays. Protection of generators, transformers, and transmission lines. Ground fault protection. Computer relaying, algorithms for protective relaying. Credit will not be given for ECGR 8141 where credit has been given for ECGR 6141.

ECGR 8143. Power System Control. (3) Cross-listed Course(s): ECGR 6143. Computer functions for automatic control of power systems. Automatic generation control, regulation of frequency and tie-line power interchanges. Automatic voltage regulation, excitation system model. Power system dynamics. Computer control centers. Credit will not be given for ECGR 8143 where credit has been given for ECGR 6143.

ECGR 8144. Electric Power Distribution Systems I. (3) Cross-listed Course(s): ECGR 6144. Prerequisite(s): Graduate standing and knowledge of fundamentals of power systems, or permission of department. The fundamental principles of the electric power delivery system with emphasis on distribution systems. Examines three-phase unbalanced system and component models, distribution power flow analysis, and radial power flow techniques. Credit will not be given for ECGR 8144 where credit has been given for ECGR 6144.

ECGR 8145. Electric Power Distribution Systems II. (3) Cross-listed Course(s): ECGR 6145. Prerequisite(s): Graduate standing, knowledge of fundamentals of power systems, and ECGR 6144 or ECGR 8144; or permission of department. Focuses on distribution automation and optimization methods applied to distribution systems operation and planning. Credit will not be given for ECGR 8145 where credit has been given for ECGR 6145.

ECGR 8146. Advanced VHDL. (3) Cross-listed Course(s): ECGR 6146. Prerequisite(s): ECGR 5146 or permission of department. Continuation of ECGR 5146. FPGA design with VHDL; VHDL modeling libraries and techniques, and VHDL coding methodology for efficient synthesized. Credit will not be given for ECGR 8146 where credit has been given for ECGR 6146.

ECGR 8147. Power System Stability and Control. (3) Cross-listed Course(s): ECGR 6146. Prerequisite(s): Graduate standing and knowledge of fundamentals of power systems, or permission of department. The fundamental principles of power system stability with emphasis on modern power grid. Examines various power system stability analyses starting from small signal stability, transient stability, voltage stability, and frequency stability. System dynamics based on various stability conditions and

controller design are also discussed. Credit will not be given for ECGR 8147 where credit has been given for ECGR 6147.

ECGR 8165. Information Theory. (3) Cross-listed Course(s): ITCS 8165. Information measures and their properties; entropy, relative entropy and mutual information. Information source models. Lossless data compression: the Kraft inequality, Shannon-Fano and Huffman codes. Typical sequences, asymptotic equipartition property, source coding theorem. Discrete memoryless channels: capacity, channel coding theorem. The additive Gaussian channel. Source coding under a fidelity constraint: rate distortion function and rate distortion theorem. Modern applications of information theory, including information security, data privacy and machine learning. Credit will not be given for ECGR 8165 where credit has been given for ECGR 6165.

ECGR 8173. Power Quality. (3) Cross-listed Course(s): ECGR 6173. Prerequisite(s): ECGR 5193 or equivalent. Definitions of power quality, types of power quality problems; sources of sags, transient overvoltages and harmonics; distribution overcurrent protection methods and their effect on power quality and reliability; harmonic analysis, principles of controlling harmonics, devices for filtering harmonics; power quality improvement methods. Credit will not be given for ECGR 8173 where credit has been given for ECGR 6173.

ECGR 8181. Embedded Operating Systems. (3) Cross-listed Course(s): ECGR 6181. Pre-/Corequisite(s): ECGR 5101 and Graduate standing. Introduction to the fundamentals of embedded operating systems with an emphasis on real-time performance. A series of labs provides students practical experience on bare metal programming, embedded Linux kernel configuration and initialization, boot loaders, kernel modules, device drivers, and interrupt handlers.

ECGR 8182. Advanced Embedded Operating Systems. (3) Cross-listed Course(s): ECGR 6182. Prerequisite(s): ECGR 6181 or ECGR 8181. An advanced course in embedded operating systems. Lectures cover multiple advanced topics in operating systems. Labs involve developing code for different components of a fully functional operating system kernel. Credit will not be given for ECGR 8182 where credit has been given for ECGR 6182.

ECGR 8183. Multiprocessor Systems Design. (3) Cross-listed Course(s): ECGR 6183. Topics include: applications of multiprocessors to digital systems design; hardware/software tradeoff considerations; master/slave, multiple/master and loosely coupled systems; data handling and synchronization problems, networking. Credit will not be given for ECGR 8183 where credit has been given for ECGR 6183.

ECGR 8184. Computer System Engineering. (3) Cross-listed Course(s): ECGR 6184. Topics include: data formats, register transfer operations, computer organization, microprogram control and ALU design. Arithmetic algorithms, I/O organization and memory organization are also covered. Specific emphasis is placed throughout on tradeoffs between hardware and software. Credit will not be given for ECGR 8184 where credit has been given for ECGR 6184.

ECGR 8185. Embedded Commercial Product Design. (3) Cross-listed Course(s): ECGR 6185. Prerequisite(s): ECGR 4101 or ECGR 5101. An advanced course in embedded system design emphasizing the development of hardware sub-systems and software to create commercial products. Architecture, software, and interface techniques. This course is project-oriented, involving the use of software and hardware design tools. Credit will not be given for ECGR 8185 where credit has been given for ECGR 6185.

ECGR 8187. Modeling and Analysis of Communication Networks. (3) Cross-listed Course(s): ECGR 6187. Prerequisite(s): Probability theory or permission of department. Communication networks; application of analytical tools for modeling and performance evaluation of these networks, including stochastic processes, Markov models, queuing theory, and teletraffic theory. Credit will not be given for ECGR 8187 where credit has been given for ECGR 6187.

ECGR 8188. Fundamentals of Wireless Systems and Protocols. (3) Cross-listed Course(s): ECGR 6188. Prerequisite(s): Graduate standing and a prior course in data communications or computer networks. Provides an overview of different wireless and mobile network standards and systems. Covers the distinct characteristics of these wireless systems that require a fundamental redesign of protocols at layer 2 to layer 4 of the network protocol stack. Protocols for medium access control, routing, and reliable transport, in addition to middleware and applications custom-made for wireless networks will be dealt with. Credit will not be given for ECGR 8188 where credit has been given for ECGR 6188.

ECGR 8189. Wireless Sensor Networks. (3) Cross-listed Course(s): ECGR 6189. Prerequisite(s): Graduate standing and knowledge of (a) fundamentals of computer networking, (b) probability and random variables, and (c) C/C++ programming, or permission from the department. Provides the fundamental principles of wireless sensor networks with emphasis on networking protocols and information processing aspects. Reviews basic principles of multi-hop wireless networks and discuss the specific design challenges for the development of networking protocols and applications with wireless sensors. Students go through hands-on tutorials and design projects with

programmable wireless sensors. Credit will not be given for ECGR 8189 where credit has been given for ECGR 6189.

ECGR 8190. Smart Grid: Characteristics, Design, and Analysis. (3) Cross-listed Course(s): ECGR 6190. Prerequisite(s): Graduate standing and knowledge of fundamentals of power systems, or permission from the department. The fundamental principles of the Smart Grid with emphasis on Grid modernization Analysis and design. Examines the design and integration of renewable energy resources to power grid, the impact of power system analysis in the context of smart grid, smart grid observability and controllability, Wide Area Monitoring and Control, Self-Healing network. Credit will not be given for ECGR 8190 where credit has been given for ECGR 6190.

ECGR 8197. Power Electronics II. (3) Cross-listed Course(s): ECGR 6197. Prerequisite(s): Graduate standing, knowledge of fundamentals of power electronics and basics of semiconductor physics, and ECGR 5144, or permission of department. Focuses on more advanced topics in power electronics. Topics include: converter modeling and control, advanced concepts in magnetic circuit design, gate and base drives, switching losses, resonant converters, zero-voltage and zero-current switching, utility-interfaced applications including FACTS, maximum power-point tracking, and power factor correction. Credit will not be given for ECGR 8197 where credit has been given for ECGR 6197.

ECGR 8264. Radio Frequency Design. (3) Cross-listed Course(s): ECGR 6264. Prerequisite(s): Permission of instructor. Design and analysis of radio frequency circuits and systems including S-parameters, impedance matching, noise, intermodulation distortion, image rejection, cascade analysis, and incorporation of these methods in the design of modern radio receivers and transmitters. Credit will not be given for ECGR 8264 where credit has been given for ECGR 6264.

ECGR 8890. Individualized Study and Projects. (1 to 6) Individual investigation and exposition of results. *May be repeated for credit.*

ECGR 8990. Industrial Internship. (1 to 3) Prerequisite(s): Completion of nine hours of graduate coursework. Full- or part-time academic year internship in engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by their graduate program director. Requires a mid-term report and final report to be graded by the supervising faculty.

ECGR 8999. Doctoral Dissertation Research. (0 to 9) Individual investigation culminating in the preparation and

presentation of a doctoral dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term.*

Economics (ECON)

ECON 5106. Labor Economics. (3) Cross-listed Course(s): ECON 4106. Economics of labor markets; topics covered include labor supply and demand, household production and the economics of the family, compensating differentials, human capital, worker mobility, income inequality, and discrimination.

ECON 5116. Public Finance. (3) Revenue and expenditure problems of governmental units, intergovernmental financial relationships and the impact of federal fiscal policy upon the American economy.

ECON 5135. Economics of Growth and Development. (3) Theories of economic growth and development applied to varying economic and social systems. Current theoretical models and their relevance to efficient allocation of resources to both the developed and the developing nations.

ECON 5141. Economics of Health and Healthcare. (3) Cross-listed Course(s): ECON 4141, HSRD 8203, PPOL 8667. Prerequisite(s): Admission to graduate program or permission of the instructor. Uses economic theory and econometrics to analyze the functioning of the health care sector and appropriate public policy. Topics include: how markets for medical care differ from other markets, the demand for medical care, the demand and supply of health insurance, the role of competition in medical markets, managed care, managed competition, and the role of the public sector in regulating and financing health care. The topic list is flexible, and student input will be solicited and welcomed.

ECON 5160. Economics of Transportation. (3) Analysis of transportation systems. Topics include: the historical development of various modes, costs and rate-making, regulation and national transportation policy.

ECON 5161. Game Theory. (3) Cross-listed Course(s): ECON 4161. Prerequisite(s): Permission of the Graduate Program Director. First course in graduate level game theory. The beginning of the course focuses on developing the techniques necessary to solve games. In the latter part of the course, game theoretic analysis is applied to a variety of topics, including, but not limited to, principal agent problems, auctions, and voting. Students see how the tools developed early in the course can be

applied to a vast array of problems in economics and related disciplines.

ECON 5171. Economics of International Trade. (3) Theory of international trade including determination of international trade patterns, welfare implications of international trade, economic integration, and effects of tariffs and quotas.

ECON 5172. Economics of International Finance. (3) Survey of international monetary theory. Topics include: exchange rate determination, balance of payments and adjustment, international liquidity, capital movements, international financial organizations, and monetary reform proposals.

ECON 5180. Industrial Organization and Public Policy. (3) An examination of monopolistic competition, oligopoly, and monopoly and questions of public policy in dealing with problems created by industrial concentration.

ECON 5181. Energy and Environmental Economics. (3) Economic issues of both energy and environment. Energy issues include the historical development of energy resources, supply and demand considerations, and projections of the future energy balance. Environmental issues are externalities, common property resources, and government regulation. Policy considerations include environmental standards, pollution charges, and property rights. Cost-benefit analysis and microeconomic theory are applied.

ECON 6001. Advanced Topics in Macroeconomics. (3) Prerequisite(s): ECON 6112, ECON 6201, and ECON 6202. Advanced treatment of selected issues in macroeconomics.

ECON 6002. Advanced Topics in Microeconomics. (3) Prerequisite(s): ECON 6112, ECON 6201, and ECON 6202. Advanced treatment of selected issues in microeconomics.

ECON 6090. Topics in Economics. (1 to 3) Prerequisite(s): permission of the department. Topics from various areas of economics. Credit hours will vary with the topic offered. *May be repeated for credit with change in topic.*

ECON 6100. Graduate Mathematical Economics. (3) Economic problems are analyzed with quantitative techniques. Topics covered include the study of economic growth models, utility maximization, homogeneous functions, dynamic systems, applications of linear programming, and constrained optimization.

ECON 6112. Graduate Econometrics. (3) Cross-listed Course(s): DSBA 6112. Prerequisite(s): Admission to graduate program and permission of Graduate Program Director. Advanced study of the theory and application of

statistics to economic problems. Topics include: derivation of least-squares estimators; maximum likelihood estimation; and problems of multicollinearity, heteroskedasticity, and autocorrelation.

ECON 6113. Cross-Section and Time-Series Econometrics.

(3) Cross-listed Course(s): STAT 6113. Prerequisite(s): Permission of Graduate Program Director. Introduces the advanced study of the theory and application of statistics to economic problems. Topics include: derivation of the least-squares estimator; methods with which to detect and correct for potential problems with the classical regression model; maximum likelihood estimation; instrumental variables regression; the problems with multicollinearity, heteroscedasticity, and autocorrelation; introduction to the time-series estimation, including ARIMA models and basic forecasting tools.

ECON 6201. Advanced Macroeconomic Theory. (3)

Cross-listed Course(s): PPOL 8701. Prerequisite(s): Admission to graduate program and permission of Graduate Program Director. Theories of aggregate income determination, inflation, unemployment, interest rates and economic growth; macro-economic consumption and investment behavior; the business cycle.

ECON 6202. Advanced Microeconomic Theory. (3)

Cross-listed Course(s): PPOL 8703. Prerequisite(s): Admission to graduate program and permission of Graduate Program Director. Theories of the firm, of the consumer, and of resource owners; determination of prices under different market structures; general equilibrium analysis and welfare economics.

ECON 6203. Financial Economic Theory. (3) Cross-listed Course(s): FINN 6203. Prerequisite(s): Admission to the graduate program and permission of Program Director. The fundamental principles of risk pricing and risk allocation in a unified framework. Discrete-time model is employed to underscore the relationship between the techniques used in finance and the economic analysis of risk. The objective is to understand the economics of asset pricing and how derivatives and options are used in practice and their limitations.

ECON 6217. Advanced Microeconometrics. (3)

Prerequisite(s): ECON 6112 or ECON 6113. Underlying assumptions regarding the population, specification, estimation, and testing of microeconomic models. Students become acquainted with a variety of extensions of conventional linear models for cross-sectional and panel data, including, but not limited to: panel data models, instrumental variables models, and qualitative response models.

ECON 6218. Advanced Business and Economic Forecasting. (3) Prerequisite(s): ECON 6112. Develops

forecasting techniques used in business decision making and techniques used in forecasting macroeconomic variables. Topics include: estimation, identification and prediction using ARMAX, state space, and Box-Jenkins models; spectral analysis; linear filtering.

ECON 6219. Financial Econometrics. (3) Cross-listed Course(s): FINN 6219. Prerequisite(s): ECON 6113, ECON 6218, or MATH 6201. Advanced time series with financial applications. Topics include: time series regressions (univariate and multivariate, stationary and non-stationary) and time series models (including ARMA, ARCH, GARCH, stochastic volatility and factor models). The emphasis will be on model properties, estimators, test statistics, and applications in finance.

ECON 6235. Monetary and Financial Theory. (3) Cross-listed Course(s): PPOL 8711. Prerequisite(s): ECON 6201 or ECON 6202, and ECON 6112. Theory and empirical tests of money supply, money demand, and financial markets; portfolio theory with special attention to portfolio choices of banks; term structure of interest rates; dynamic models of money and economic activity.

ECON 6238. Real Estate and Urban Economics. (3)

Prerequisite(s): ECON 2102. Cross-listed Course(s): MBAD 6238 and MSRE 6238. Focuses on the fundamental economic forces that create urban areas, with a special emphasis on land markets. Integrates economic theory to better understand the market forces that impact applied real estate development projects. Topics include: urban growth and development; land valuation; the modelling and estimation of agglomeration economies; the costs of cities and their internal structure with emphasis on land use regulations and transportation; amenities and the local supply of labor; the sizes and functions of cities; affordable housing; and local public finance.

ECON 6240. Economics of International Finance. (3)

Prerequisite(s): ECON 6201, ECON 6202, and ECON 6112. Open economy macroeconomics, international transmission of inflation and unemployment, internal and external balance; balance of payments and international payments mechanisms; determination of exchange rates and effects of hedging and speculation.

ECON 6241. Economics of International Trade. (3)

Prerequisite(s): ECON 6201, ECON 6202, and ECON 6112. Examines the causes and consequences of trade using Ricardian and neoclassical models. Considers extensions, modifications, and empirical tests of these models. Analysis of tariffs, quotas, other trade restrictions, export subsidies, and trends in current trade policy.

ECON 6250. Advanced Urban and Regional Economics.

(3) Cross-listed Course(s): PPOL 8705. Prerequisite(s): Admission to graduate program. Applications of

microeconomic theory to problems of cities, metropolitan areas and regions; methods in regional analysis, location theory, land-use planning, measurement of economic activity; transportation, housing, poverty, and growth issues.

ECON 6255. Benefit-Cost Analysis. (3) Principles, practices, and applications for defining and comparing the benefits and costs of public policy programs and private sector projects, including techniques useful for organizing and analyzing data, evaluating programs systematically, and developing a framework for decision making while recognizing ethical implications, measurement problems, and time value problems.

ECON 6256. Public Economics. (3) Cross-listed Course(s): PPOL 8709. Prerequisite(s): MATH 1241 or equivalent, and permission of the Graduate Program Director. Public economics is the study of the way governments choose spending, taxation, and regulatory policy; the ways such policies may affect economic welfare; and mechanisms to evaluate the economic effects of such policies.

ECON 6257. Applied Computational Economics. (3) Prerequisite(s): ECON 6201 and ECON 6202, or permission of the Graduate Program Director. Introduction to computational approaches for solving economic models. Topics include: interpolation and approximation techniques, numerical optimization, numerical solutions to systems of nonlinear equations, quadrature formulas for numerical integration, Monte Carlo simulation, and basic solution algorithms for economic dynamics.

ECON 6800. Directed Study in Economics. (1 to 3) Prerequisite(s): Admission to graduate program. Independent study of a theoretical and/or a policy problem in a special area of economics. Topics of the investigation may originate from the student or from the faculty member supervising the study. *May be repeated for credit up to 6 credits and permission of Graduate Program Director.*

ECON 6901. Research Methods for Economists I. (3) Prerequisite(s): ECON 6112 or ECON 6113; and either ECON 6201, ECON 6202, or ECON 6203. Research programs in economics; problem identification; interpretation of statistical results; bibliographic search; data sources and collection; selection of statistical technique; preparation of reports and proposals.

ECON 6902. Research Methods for Economists II. (3) Prerequisite(s): ECON 6901. Critique of economic research and reports, presentation of econometric results and reports. The student will develop a research project, perform statistical tests, and present the results orally and in a major research paper.

ECON 6999. Graduate Thesis Research. (1 to 6) Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

Education: Curriculum and Instruction (EDCI)

EDCI 6120. Media Literacies and Pedagogy in Education. (3) Introduces teacher leaders to methods for developing effective and engaging curricula that focuses on the integration of 21st century cutting-edge technology with pedagogical practices. This course aims to demystify contemporary uses of new media (e.g., smartphones, blogs, social networking, video sharing/digital filmmaking, gaming, etc.) in urban classrooms, by demonstrating how media education can supplement traditional approaches to learning. Teacher leaders are exposed to research on varied pedagogical methodologies, which have: (a) supported the development of more responsive instruction; (b) provided evidence of increases in students' motivation to achieve, and (c) facilitated social action.

EDCI 6201. Storying Schools. (3) Cross-listed Course(s): EDCI 8201. Analysis of contemporary ethnographic representations and memoirs of teaching and learning with implications for 21st century practice.

EDCI 8004. Topics in Analysis. (3) Cross-listed Course(s): MATH 6004. Prerequisite(s): Permission of department. Topics in analysis selected so as to complement regular course offerings in this area of mathematics. *May be repeated for credit with change of topic.*

EDCI 8008. Topics in Geometry and Topology. (3) Cross-listed Course(s): MATH 6008. Topics selected from Euclidean geometry, non-Euclidean geometry, projective geometry, differential geometry, point-set topology, algebraic topology. *May be repeated for credit with change of topic.*

EDCI 8010. Topics in Mathematics Education. (3) Examination of special topics germane to mathematics education (including mathematics teacher education) at the elementary, middle, and secondary school levels as well as the community and four-year college. Examination of special topics in specific areas germane to student learning, teacher preparation, professional learning, and educator development. Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

EDCI 8040. Topics in Literacy Education. (3) Cross-listed Course(s): READ 6000. Examination of special topics

germane to reading education in urban-regional environments at the elementary, middle, and secondary school levels as well as the community and four-year college, including historical perspectives on current problems, effectiveness of programs and practices in urban schools, and emerging theories of learning. Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

EDCI 8041. Topics in Literacy Research. (3) Prerequisite(s): Students must be admitted to the Ph.D. in Curriculum and Instruction Program or permission of the Department of Middle, Secondary, and K-12 Education. Examination of special topics germane to literacy research in education environments at the elementary, middle, and secondary school levels as well as the community and four-year college. Examination of special topics in specific areas germane to literacy research as it relates to teacher preparation, professional learning, and the effectiveness of programs and practices for literacy development of K-12 students. Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

EDCI 8061. Topics in Urban Educational Research. (3) Examination of the research in specific areas germane to urban educational settings and problems. Emphasis on different research questions and methodologies used to investigate similar problems. Examination of alignment of research findings with educational change in urban environments of the elementary, middle, and secondary school levels as well as the community and four-year college. *May be repeated for credit with change of topic.*

EDCI 8070. Topics in Urban Educational Leadership. (3) Examination of special topics germane to leadership in urban education environments at the elementary, middle, and secondary school levels as well as the community and four-year college. Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

EDCI 8075. Topics in Urban-Regional Education. (3) Examination of special topics germane to education in urban-regional environments at the elementary, middle, and secondary school levels as well as the community and four-year college. Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

EDCI 8080. Topics in Curriculum, Instruction, and Educator Development. (3) Special topics germane to curriculum and instruction in education environments at the elementary, middle, and secondary school levels, as well as the community and four-year college. Also examined are specific areas of teacher preparation, professional

learning, and educator development. The course has extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

EDCI 8084. Topics and Research in Social Studies

Education. (3) Cross-listed Course(s): MDSK 6254, and MDSK 6354. Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction program or permission of Department of Middle, Secondary, and K-12 Education. An introduction to and analysis of research in social studies curriculum, instruction, and educator development. Provides an overview of contemporary research perspectives and paradigms in the social studies, including civics, economics, geography, history, and social science education and a survey of critical and justice-oriented theoretical frameworks in social studies. Opportunities are presented to interpret and synthesize the social studies research literature, examine social studies curriculum history and trends, and explore development of classroom-based research studies in the social studies.

EDCI 8101. Foundations of Mathematics. (3) Cross-listed Course(s): MATH 6101. Prerequisite(s): Permission of department. Introduction to the fundamentals of set theory and logic. Topics include: theorem proving, sets, functions, relations, and constructing number systems.

EDCI 8102. Real Analysis for Secondary Mathematics

Teachers. (3) Cross-listed Course(s): MATH 6102. Prerequisite(s): EDCI 8101 or MATH 6101, and permission of department. Provides a theoretical understanding of the basics of real analysis. Topics include: limits and continuity, derivatives, integrals, and Taylor series.

EDCI 8103. Computer Techniques and Numerical Methods.

(3) Cross-listed Course(s): MATH 6103. Prerequisite(s): Permission of department. Computer systems, programming, and the computer solution of numerical problems.

EDCI 8106. Modern Algebra for Mathematics Teachers. (3)

Cross-listed Course(s): MATH 6106. Prerequisite(s): MATH 3163 or its equivalent or permission of department. Topics chosen from group theory, rings and ideals, integral domains, fields and elementary Galois theory.

EDCI 8107. Linear Algebra for Mathematics Teachers. (3)

Cross-listed Course(s): MATH 6107. Prerequisite(s): MATH 2164 or its equivalent or permission of department. Systems of linear equations, matrices, vector spaces, linear transformations, determinants, canonical forms of matrices, inner products.

EDCI 8112. Theoretical Foundations of Learning

Mathematics. (3) Cross-listed Course(s): MAED 6122. Introductions to theories of learning that have influenced

the teaching of mathematics in K-12. An overview of theories that have guided reforms in mathematics teaching; contemporary constructivist theories of mathematics learning.

EDCI 8113. Research in Mathematics Education. (3) Cross-listed Course(s): MAED 6123. An introduction and overview of research in the teaching and learning of mathematics in K-12. Overview of contemporary research perspectives and paradigms; interpreting and synthesizing the research literature; survey of contemporary research problems in mathematics teaching and learning; development of classroom-based research studies.

EDCI 8114. Advanced Topics in Mathematics Education. (3) Prerequisite(s): Enrollment in the Mathematics Education specialization of the Doctoral Program in Curriculum and Instruction. Advanced research topics in the teaching and learning of mathematics. Includes a survey, interpretation, and synthesis of contemporary research problems in mathematics teaching and learning. *May be repeated for credit with change of topic.*

EDCI 8115. Issues in the Teaching of Mathematics. (3) Cross-listed Course(s): MAED 6124. Study of major issues affecting mathematics education: analysis of the impact of learning theories on methods of teaching; assessment methods for improving mathematics learning; analysis of the historical and programmatic development of the mathematics curriculum leading to current trends, issues, and problems; and analysis of the role of technology in the mathematics classroom.

EDCI 8118. Non-Euclidean Geometry. (3) Cross-listed Course(s): MATH 6118. History of Euclid's Fifth Postulate and attempts to prove it; work of Gauss, Bolyai, Lobachevsky and others; systematic development of hyperbolic geometry; relative consistency of hyperbolic geometry; relative consistency of hyperbolic and Euclidean geometries.

EDCI 8120. Perspectives in Literacy Research, Policy, and Practice. (3) Examination of competing definitions of literacy and development of literacy practices related to debates in American education public policy about the ends of schooling, the strategies of teaching, and the priorities of the language arts curricula. Evaluation of assumptions, reasoning, and research bases linking literacy to policy. Study of the historical and current methods of establishing district, statewide and federal policies about literacy education programs, materials, personnel, grants, and licensure.

EDCI 8121. Applied Research Methods in the Teaching of English. (3) Cross-listed Course(s): ENGL 6674. Provides the opportunity to apply research methods in classrooms.

Examine identities as readers, writers, teachers, and especially as classroom researchers.

EDCI 8129. Linguistics and Language Learning. (3) Readings in, discussions of, and application of linguistically oriented theories of language acquisition, directed toward gaining an understanding of language-learning processes and stages.

EDCI 8133. Multiculturalism and Children's Literature. (3) Cross-listed Course(s): ENGL 6104. Focuses on significant authors, illustrators, or themes in children's and/or adolescent literature.

EDCI 8134. Early Black American Literature. (3) Cross-listed Course(s): ENGL 6147. A survey of African-American literature, emphasizing the major authors, those relevant historical and social factors, and those specific literary movements that have influenced the development of African-American literature.

EDCI 8139. Perspectives in African American Literature. (3) Cross-listed Course(s): ENGL 6147. A survey of African-American literature, emphasizing the major authors, those relevant historical and social factors, and those specific literary movements that have influenced the development of African-American literature.

EDCI 8140. Current Issues and Practices in Literacy Education. (3) Cross-listed Course(s): READ 6100. Theories, research, and instructional methods associated with reading and language arts, preschool through high school; questions of effectiveness related to instructional approaches and materials; related topics such as multicultural literacy, the role of phonics, and assessment.

EDCI 8153. Pro-Seminar in Elementary Education. (3) Introduces candidates to elementary education faculty and their research programs to allow doctoral students to connect early in their program with faculty who will chair or serve on their committees. *Graded on a Pass/Unsatisfactory basis.*

EDCI 8156. Critical Issues in K-12 Curriculum and Instruction. (3) Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction and permission of department. Examines research, innovative practices and current trends in K-12 curriculum design, instructional methods, and educator development. Course includes analysis of historical influences and contemporary approaches shaping curriculum, instruction, educational environments, and professional learning experiences. Emphasis is placed on enhancing effective teaching, supporting meaningful professional growth, and creating dynamic, engaging educational experiences for educators and learners across elementary, middle, and high school settings.

EDCI 8157. Analysis of Inquiry in Curriculum, Instruction, and Educator Development. (3) Prerequisite(s): RSCH 8110, RSCH 8111, and RSCH 8210. An analysis of the underlying theoretical and philosophical frameworks of inquiry teaching and learning in K-12 school settings and in educator professional development; examination of current research on models of student and teacher inquiry; and the opportunity to develop a pilot study to investigate effects of inquiry on teaching and learning in K-12 settings or educator development.

EDCI 8158. Research in Curriculum, Instruction, and Educator Development. (3) An analysis of research topics and methodologies in curriculum, instruction, and educator development. Examination of contemporary research perspectives and paradigms in K-12 education; interpreting and synthesizing the research literature; survey of contemporary research inquiries in curriculum, instruction, and educator development; design and implementation of a pilot research study. *May be repeated for credit up to 6 credit hours.*

EDCI 8160. Readings in Mathematics Education. (3) Readings in the teaching and learning of mathematics K-16; analysis of the historical development of the K-16 mathematics curriculum leading to current trends, issues, and problems; theory, methods, and techniques for assessment; and analysis of contemporary issues.

EDCI 8180. Critical Issues and Perspectives in Urban Education. (3) An introduction to current contemporary issues in urban education. Topics include the influence of social, economic and geographical factors as they intersect with various national, state and local education policies. Topics will be examined from various perspectives of key stakeholders with a focus on school improvement. This is an intensive reading and writing course that also requires participation in school and/or community activities to better understand the urban environment.

EDCI 8182. Power, Privilege, and Education. (3) Addresses human interconnections and their impact on urban schools and communities. It investigates the intersections of social constructions and human interactions, and their implications for pedagogy and curriculum design. The course explores new educational possibilities for empowering educational futures tailored for learners navigating rapidly evolving urban and contemporary educational contexts.

EDCI 8183. Teaching Multilingual Learners. (3) Cross-listed Course(s): TESL 5103. For current and future teachers of Literacy Education, Multilingual Education, and English as a Second Language to demonstrate competencies in a variety of pedagogical approaches, methods, and techniques of teaching multilingual learners and other

relevant competencies prescribed by the state of North Carolina.

EDCI 8184. Social Theory and Education. (3) An overview of classical and contemporary developments and debates in social theory, as well as their influences in educational research. It emphasizes the principles and processes of theory development and the application of theory in research. Enhances understanding of theoretical models and analyses and how they form social lens for the examination of school processes.

EDCI 8186. Globalization, Urbanization, and Urban Schools. (3) Explores globalization locally and internationally, with special emphasis on how global development processes are impacting urban communities and schools. The course investigates conceptual and theoretical issues underlying globalization, and their influence on the production of knowledge, educational policy, and school curricula.

EDCI 8201. Perspectives in Immigration and Urban Education. (3) Cross-listed Course(s): EDCI 6201. Examines theories, issues, policies and historical trends in the education of immigrant students in urban public schools. Topics include: theories of immigrant adaptation in relation to race, gender, social class, language learning, and immigration status, demographic trends and their influence on urban schools and on teacher preparation, broader political influences on immigrant education, and the role of family and community in shaping immigrant students' educational trajectories. Students critically analyze scholarly research and theoretical work related to immigration and education in variety of fields.

EDCI 8202. Ethnographies of Urban Schools, Communities, and Literacies. (3) An examination of contemporary ethnographic representations of urban schools, communities, and literacies with specific attention to storying as a humanizing and decolonizing approach to qualitative research.

EDCI 8206. Globalization, Communities, and Schools. (3) Cross-listed Course(s): TESL 6206. Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction program. Provides doctoral students a shared space to examine qualitative representations the intersection of globalization and education with specific attention to the experiences of immigrant communities and the contemporary phenomenon of transnationalism. The shared readings, in many cases stemming from dissertations, are intended to serve as potential "mentor" texts as doctoral students realize a research agenda. Moreover, the course ensures an additional layer of certainty that candidates will "establish a respectful environment for a diverse population of students" by embracing diversity in the school community and in the world.

EDCI 8225. Topics and Issues in Middle Grades Education.

(3) Cross-listed Course(s): MDLG 6225. Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction and permission of program advisor. Examination of curriculum, instruction, and educational practices in the middle grades (6-9), including research, trends, and issues unique to that philosophy. Emphasis on broadening an understanding of foundational components, organizational patterns, instructional programs, and management techniques.

EDCI 8250. Literacy and Language Development (3)

Cross-listed Course(s): READ 6250. Introduction to the research interests of faculty, with emphasis on research in urban educational issues and problems. Seminar and individual support for replication attempts, instrument development and field-testing in pilot studies, practice in and critique of different methods of data-gathering and data analysis.

EDCI 8252. K-12 Writing Development and Instruction. (3)

Cross-listed Course(s): READ 6252. Theories, research, and critical issues related to students' writing development and effective writing instruction. Field experience required.

EDCI 8254. Collaborative Leadership in Literacy Education.

(3) Cross-listed Course(s): READ 6254. Prerequisite(s): Completion of Phase II and READ 6260 course. Investigates models and strategies for assuming the leadership responsibilities of a literacy specialist, including mentoring, staff development, school-wide literacy program development and assessment, supporting the action research of teachers, and developing partnerships with parents and community volunteers.

EDCI 8255. Disciplinary Literacy. (3)

Cross-listed Course(s): READ 6255. Prerequisite(s): Completion of Phase I. Theories, research, and instructional methods associated with reading and writing in the content areas, with a special emphasis on grades 6-12. Field experience and action research project are required.

EDCI 8256. Literacy Assessment and Intervention. (3)

Cross-listed Course(s): READ 6260. Prerequisite(s): Completion of Phase II. Examination, uses, and critique of theories and research about literacy processes and problems; diagnosis and correction of reading disabilities; instructional strategies and action research designed to improve reading proficiency of K-12 learners.

EDCI 8260. Psychological and Historical Influences on Society. (3)

Cross-listed Course(s): ELED 6260. Explores the interplay between historical events and psychological theories in shaping societies. Students will examine how social structures, cultural shifts, and human behavior influence historical developments. Through educational case studies and research, the course provides insight into the factors that drive societal change over time.

EDCI 8261. Human Identity Development. (3)

Cross-listed Course(s): ELED 6261. Prerequisite(s): EDCI 8260. Human identity development is a lifelong process where individuals shape a sense of self, encompassing values, beliefs, affiliations, and goals. It is a key aspect of psychosocial development as children and adolescents explore and commit to different facets of their identity. This process is influenced by various factors, including social interactions, particular contexts, and personal experiences. This course will explore human identity development with a goal of self-reflection to promote successful educator effectiveness and engagement in high-need and demographically varied schools.

EDCI 8262. Social Dynamics and Systems that Educate. (3)

Cross-listed Course(s): ELED 6262. Prerequisite(s): EDCI 8260 or EDCI 8261. Examines contemporary educational practices and explores innovative approaches to educating and learning. Students will analyze current challenges within educational systems and investigate strategies for improvement. Through critical reflection and research, participants will develop actionable plans to enhance educational outcomes.

EDCI 8263. Social Action and Advocacy. (3)

Cross-listed Course(s): ELED 6263. Prerequisite(s): EDCI 8260, EDCI 8261, and EDCI 8262. Advocacy and social action are distinct yet interconnected ways to effect change. Advocacy involves actively speaking in favor of a cause or issue, while social action encompasses a broader range of activities to create positive social change. Social action often involves mobilizing communities around schools and groups to address systemic issues and promote fairness. This class will explore the characteristics of both social and advocacy to create change in and beyond educational institutions.

EDCI 8265. Multiliteracies in a Global World: Reading and Writing Texts in New Times. (3)

Cross-listed Course(s): READ 6565. Multiliteracies takes literacy beyond a focus on traditional print-based literacy to multiple-forms of knowing, including print, images, video, and combinations of forms in digital contexts. Students are immersed in both the theory and practice of multiliteracies and considers how globalization has created a more complex environment for teachers and students.

EDCI 8300. Social Stratification and Urban Schools and Communities. (3)

Prerequisite(s): EDCI 8184. Investigates social stratification in schools and society. It uses school-society integration framework to explore socially reproducing aspects of the social and economic systems. Through examination of current and past patterns of social organizations and power structures, it produces knowledge about education and mobility opportunities.

Emphasizes the socioeconomic implications of school stratification and how this impacts students' life chances.

EDCI 8310. Transformative Black Education. (3) Engages students in an in-depth study of the philosophical, psychological, cultural and historical bases for Black education and the theoretical perspectives underlying a transformative approach to the education of students of African descent in America. The issues covered include the education debt, resilience, psychological effects of racism, education in the Diaspora, African-centered education, culturally nurturing curriculum and pedagogy, and African students in America.

EDCI 8311. Critical Readings in Urban Education Research. (3) Prerequisite(s): RSCH 8111 and RSCH 8121. Furthers students' understanding and practice of Urban Education research studies conducted primarily through qualitative research. The methods presented and the studies covered are of particular importance to anyone conducting qualitative research in urban schools and communities. One critical component of this course is the study of a variety of standpoints and anti-racist methodologies in Urban Education.

EDCI 8312. Urban Schooling, Curriculum, and Pedagogy. (3) At the heart of 'Urban Schooling' are curriculum and pedagogy. Explores the literature on successful teachers, principals, and educational reformers who have developed curriculum and/or pedagogy that have proven effective in urban schools. Critically examines current practices such as managed curriculum and teaching to the test in urban classrooms and proposes education for democracy, that is culturally relevant and emancipatory.

EDCI 8314. Urban Educational Reform. (3) Explores real-time, modern day educational reform efforts and initiatives in urban schools and communities. The major focus is on the public policymaking process (i.e., agenda setting) using youth participatory action research. Students will be exposed to interdisciplinary literature on theories, concepts, and models of reform as it operates in two separate, yet interrelated disciplines- political science and urban education.

EDCI 8320. Social Deviance, Delinquency, and Education. (3) Critically examines social deviance and delinquency and their influence on education and beyond. Examines how violence against children is sustained through public policies and social structures and institutions. Explores contemporary forms of deviance, and how they affect student outcomes. Particular consideration is given to the causes of crime, as well as the punishment and treatment of offenders. In addition, special attention is given to deterrence and crime prevention.

EDCI 8330. History of Urbanization and Its Impact on Schooling. (3) Focuses on a historical contextualization of urban developments and their impacts on schools. It examines the American educational system as it relates to politics, economic, cultural practices and public policies. The course explores the shift in the American educational system from rural to urban schools, and it investigates how urbanization shaped schools and created the framework for current issues in urban schools. The course concludes with an analysis of urbanization in Charlotte, North Carolina and how Charlotte schools have been impacted.

EDCI 8460. Internship in Urban Education. (3) Prerequisite(s): Permission of instructor. Internship experiences planned and guided cooperatively by University and school personnel.

EDCI 8462. Supervision of Student Teachers. (3) Concentrated practice in the supervision of student teachers with emphasis on support of student teachers in urban schools. Internship experience with direct faculty supervision in seminars and school settings.

EDCI 8475. College Co-Teaching Internship in Curriculum and Instruction. (3) Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction program. Pre- or Corequisite(s): EDCI 8681. Offers doctoral students an opportunity to gain theoretical and research-based knowledge about college teaching, as well as an opportunity to apply those ideas through a co-teaching internship. Completion of this internship including prerequisites, enables students to co-teach a course as a graduate student or provide coaching to other students if those opportunities become available through the program. *May be repeated for credit up to 9 credit hours.*

EDCI 8485. College Teaching and Educator Development Internship. (3) Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction program. Pre- or Corequisite(s): EDCI 8681. This internship offers doctoral students an opportunity to apply theoretical and research-based knowledge, skills, and dispositions about college teaching or educator professional development within the context of the Cato College of Education coursework and/or school partnerships. This internship, including prerequisites, enables students to be a co-instructor of a College course as a graduate student with faculty mentoring OR provides the opportunity to coach/supervise/or lead professional development experiences for College of Education teacher candidates or other professional educators if those opportunities become available through the program. *May be repeated for credit up to 9 credit hours.*

EDCI 8609. Curriculum and Instruction Seminar. (3) Cross-listed Course(s): MATH 6609. A series of regularly scheduled meetings in which each student presents one or more topics selected by the instructor.

EDCI 8620. Pro-Seminar in Curriculum, Instruction, and Urban Education Leadership. (3) Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction program. Introduces candidates to professional opportunities for curriculum and instruction, University resources to advance doctoral studies, and education faculty and their research programs. Provides doctoral students opportunities to develop a sense of research, teaching, and service interests and responsibilities of educational professionals in the academe, non-profit and private sectors, district and/or state curriculum and instructional leadership, and urban community outreach and engagement.

EDCI 8640. Readings in Literacy Research. (3) Study of methodology and findings of historical and current research about needs and characteristics of diverse literacy learners in urban-regional environments, successful programs and policies, and promising solutions to educational challenges confronting literacy teachers and literacy learners.

EDCI 8650. Scholarly Readings and Research in Curriculum, Instruction, and Educator Development. (3) Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction and permission of program advisor. Engages in the exploration, interpretation, and synthesis of significant scholarly literature in curriculum, instruction, and educator development. Actively examines foundational and contemporary research, emphasizing how thoughtful engagement with scholarly readings informs curriculum, educational practices, instructional decision-making, and professional growth. Particular attention is given to educational theory, research, policy and practice and the implications for teaching and learning in K-12 education.

EDCI 8655. Seminar on Practice-Based Teacher Education and the Science of Learning. (3) Prerequisite(s): Admission to Ph.D. in Curriculum and Instruction program. Offers doctoral students an opportunity to develop theoretical and research-based knowledge on key aspects of emerging trends in teacher education: practice-based teacher education and the science of learning. Seminar activity includes immersive experiences in which students take part in a cycle of instructional practice: including the modeling of teacher practices, use of video exemplars of instruction, rehearsal of practices, and strategies for academic coaching. Also includes a unique "clinical" experience in which students observe knowledgeable instructors in practice-based teacher education and learning science coursework.

EDCI 8660. Readings in Urban Educational Research. (3) Study of methodology and findings of historical and current research about needs and characteristics of urban schools, diverse populations in urban-regional environments, legal and ethical issues, policy-making, and

promising solutions to educational challenges of poverty, social justice, language differences, and conflicting values.

EDCI 8681. Seminar in College Teaching. (3) Issues, theories, and research about teaching late adolescent and adult learners. Limited opportunities for supervised teaching experiences with faculty who support students as they teach or co-teach undergraduate courses.

EDCI 8682. Seminar in Professional and Grant Writing. (3) Introduces the forms of professional and grant writing expected of education professionals. Emphasis on writing for publication and writing for federal and state funding. Collaborative writing and peer assessment will be part of the process.

EDCI 8685. Sociocultural Perspectives Language and Literacy. (3) Focuses on sociocultural aspects of literacy and language. Students are immersed in texts and theorists foundational to this line of inquiry and scholarship including the work of Lev Vygotsky, Mikhail Bakhtin, and James Wertsch. The role of culture and social interaction and their influence on language development and learning are explored, as well as its profound implications for teaching, schooling, and education. Students will apply these theories to the analysis of data. The seminar course is an optional selection for students in the Curriculum & Instruction doctoral program.

EDCI 8699. Dissertation Proposal Seminar. (3) Prerequisite(s): Permission of Program Coordinator, Concentration Coordinator, or Advisor. Identification of a research question and development of the proposal for an original research study appropriate for the dissertation requirement. *May be repeated for credit.*

EDCI 8840. Independent Study in Reading, Language, and Literacy. (3) Cross-listed Course(s): READ 6800. Prerequisite(s): Permission of the student's advisor. Independent study of a literacy education problem or issue under the supervision of an appropriate faculty member. *May be repeated for credit.*

EDCI 8850. Independent Study in Curriculum and Educator Development. (3) Prerequisite(s): Permission of the program advisor. Independent study of an elementary, middle grades, secondary, or teacher education problem or issue under the supervision of an appropriate faculty member. *May be repeated for credit.*

EDCI 8860. Independent Study in Mathematics Education. (3) Independent study of a mathematics education problem or issue under the supervision of an appropriate faculty member. *May be repeated for credit up to 12 credit hours.*

EDCI 8880. Independent Study in Urban Education. (1 to 3)
Prerequisite(s): Permission of the student's advisor.
Independent study of an urban education problem or issue under the supervision of an appropriate faculty member.
May be repeated for credit.

EDCI 8999. Dissertation Research. (3) Prerequisite(s): Committee approval of the dissertation proposal.
Execution of original research study that addresses the solution to an urban educational problem in curriculum, teaching, learning, or leadership. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Education (EDUC)

EDUC 5100. 21st Century Learners. (3) Explores how educators and others can build mutually respectful relationships with students and families in urban schools and communities. Particular attention is given to engagement frameworks that help to create a safe, caring, and positive learning space.

EDUC 5150. Principles of Coaching I. (3) The role of coaches and models of coaching are examined. An in-depth exploration of various coaching approaches prepares candidates for planning coaching conversations, leading professional learning communities, and responding to individual teacher needs. Synchronous meetings may be held, as necessary, with individual students to provide additional course support, as indicated through student or instructor request.

EDUC 5151. Coaching for an Equitable Learning Environment. (3) Pre- or Corequisite(s): EDUC 5150. Candidates examine characteristics of an equitable learning environment, how to create and maintain these environments, and how to coach and support other educators' work creating and maintaining these environments. Synchronous meetings may be held, as necessary, with individual students to provide additional course support, as indicated through student or instructor request.

EDUC 5152. Principles of Coaching II. (3) Prerequisite(s): EDUC 5150. Candidates advance teacher leadership development and apply skills and knowledge learned in previous courses in this program, and expand into exploring coaching cycles, frameworks, and critical conversations. Synchronous meetings may be held, as necessary, with individual students to provide additional course support, as indicated through student or instructor request.

EDUC 5153. Application of Coaching Principles. (3)
Prerequisite(s): EDUC 5150 and EDUC 5151. Pre- or Corequisite(s): EDUC 5152. Candidates synthesize and apply skills and knowledge learned in previous courses. Candidates facilitate a Professional Learning Community (PLC) where they unpack a literacy or mathematics standard. They also engage in an instructional coaching cycle, and reflect on their experiences. Synchronous meetings may be held, as necessary, with individual students to provide additional course support, as indicated through student or instructor request. Furthermore, students working in schools and, by nature, the program objectives require that they work with other teachers or teams to engage in the coaching practices applicable to the course. These experiences are necessary to achieve the objectives.

EDUC 6000. Topics in Education. (1 to 6) May include classroom and/or clinical experiences in the content area.
May be repeated for credit with permission of department.

EDUC 6101. Youth Leadership and Family Engagement. (2 to 3) Explores how educators and others can build mutually respectful relationships with students and families in urban schools and communities. Particular attention is given to engagement frameworks that help to create a safe, caring, and positive learning space. *May be repeated if a grade of C or below or a U is received.*

EDUC 6144. Introduction to National Board Certification. (3) Provides a deeper understanding of the National Board for Professional Teaching Standards Certification Process. Emphasis on broadening an understanding of foundational components, including the National Board as a certifying entity, history of the certification process, National Board Standards for each content area, Core Propositions, what every teacher should know and be able to do, learning to be a reflective practitioner, and the steps in the certification process.

EDUC 6254. Individualizing Instruction for All Learners. (3)
Prerequisite(s): Enrollment in M.Ed. in Elementary Education with Concentration in Special Education, M.Ed. in Special Education, or M.Ed. in Reading Education; or permission of instructor. Provides content on instructional modifications/adaptations related to meeting the individual learning needs of students. This course focuses on teaming, collaboration, and creating a classroom environment in which all learners can be successful. Differences among learners that are influenced by development and exceptionalities are explored using case study methodology.

EDUC 6310. Contemporary Issues and Practices of National Board Certification. (3) Corequisite(s): EDUC 6320. An overview of contemporary issues and practices of

National Board Certification through the investigation of current research, certification area standards, core propositions, and the process for achieving certification.

EDUC 6320. Planning and Delivering Effective Instruction for National Board Certification. (3) Corequisite(s): EDUC 6310. Prepares students for planning and delivering effective instruction for completion of National Board Certification. An overview of standards, research-based instructional strategies, and assessment techniques are provided.

EDUC 6330. Teaching Practice and Learning Environment for National Board Certification. (3) Prerequisite(s): EDUC 6310 and EDUC 6320. Corequisite(s): EDUC 6340. Prepares students for evaluating and implementing research-based pedagogical practices. Students investigate teaching practice and the learning environment related to National Board Certification. An overview of standards, research-based pedagogical practices, and video analysis are provided.

EDUC 6340. Becoming an Effective and Reflective Practitioner for National Board Certification. (3) Prerequisite(s): EDUC 6310 and EDUC 6320. Corequisite(s): EDUC 6330. Prepares students for evaluating and implementing research-based leadership/learner, community outreach and family/parent outreach opportunities related to National Board Certification. An overview of current research is provided.

EDUC 7126. Comparative Education. (3) Analysis of sociocultural forces affecting educational planning and comparison of contemporary educational systems of selected countries and the United States.

Education: Learning, Design, and Technology (ELDT)

ELDT 5100. Technology Integration in Education. (3) Computer systems and software for enhancing teaching, learning, and educational management; examining issues related to the appropriate selection, integration, and evaluation of technology in educational contexts.

ELDT 6000. Topics in Learning, Design, and Technology. (1 to 6) Variable topics in learning, design, and technology. *May be repeated for credit with change of topic and permission of department.*

ELDT 6100. Foundations of Learning, Design, and Technology. (3) Contemporary issues and historical development of learning, design, and technology. An

overview of learning theory, analysis and design of learning environments, instructional design models, technology innovations, and factors affecting the use of technology for learning.

ELDT 6101. Learning Principles in Learning, Design, and Technology. (3) The examination of how people learn in a variety of instructional settings. Characteristics of the different learners are examined. Students investigate several learning theories to inform better instructional design decisions.

ELDT 6102. Research in Learning, Design, and Technology. (3) Introduction to research topics, issues, and trends in learning, design, and technology. Focus on knowledge and skills related to examining research themes in learning, design, and technology, and how theories and methods inform research and practice.

ELDT 6110. Instructional Design. (3) Cross-listed Course(s): ELDT 8110. Instructional analysis, design and evaluation principles and practices; gaining practical experience applying theoretical understandings of instructional design principles and processes such as goal and task analysis, learner and context analysis, instructional strategies, selection and development of instructional materials, and formative and summative evaluation.

ELDT 6120. Current Trends in Learning, Design, and Technology. (3) Examination of current and future trends in learning, design, and technology. Students also examine the most current literature in the field and professional organization trends and recommendations.

ELDT 6121. Advanced Instructional Design. (3) Prerequisite(s): ELDT 6110. Advanced instructional design techniques; students create instructional materials and learning environments using a variety of systems approaches.

ELDT 6130. Instructional Multimedia Development. (3) Cross-listed Course(s): ELDT 8130. Planning, developing, and evaluating instructional multimedia products based on learning principles and research-based best practices.

ELDT 6135. Learning Media, Resources, and Technology. (3) Cross-listed Course(s): ELDT 8135. Selection, use, and evaluation of technological innovations in instructional media. Students learn to make professionally sound decisions in selecting appropriate processes and resources to provide optimal conditions for learning based on principles, theories, and effective practices.

ELDT 6140. Instructional Video Development. (3) Cross-listed Course(s): ELDT 8140. Planning, developing, and evaluating instructional video products based on learning principles and research-based best practices.

ELDT 6145. Visual Design of Instructional Products. (3)

Cross-listed Course(s): ELDT 8145. Planning, developing, and evaluating instructional print and electronic products based on learning principles and research-based best practices. Doctoral students will be provided a differentiated assignment to research on visual design.

ELDT 6150. Design, Development, and Evaluation of Online Learning Systems. (3)

Fundamentals of creating effective online teaching and learning systems are covered. Topics include: research-based best practices in the design, development, and evaluation of online instruction, technological applications available to support online teaching and learning, characteristics of virtual students, instructional methodologies for online teaching and learning, and future directions of online teaching and learning research. Differentiated assignments are provided for doctoral students.

ELDT 6160. Designing Learning Systems with Simulation and Game Technology. (3)

Educational game and simulation technology learning systems. Students examine principles of game and simulation design, and current research addressing the integration and use of games and simulations in education settings. Emphasis placed on the use of instructional design principles to identify quality characteristics of digital games and simulations, and direct the design and development of these technologies for integration in to instructional content. Differentiated assignments provided for doctoral students.

ELDT 6170. Human Performance Technology. (3) Cross-listed Course(s): ELDT 8170. An introduction to the field of human performance technology. Examines basic concepts and principles of human performance technology, human performance system models, and various approaches to solving human performance problems. In-depth analysis of performance improvement interventions and their implementation within organizations is emphasized.

ELDT 6180. LDT Project Management and Team Leadership. (3)

Prerequisite(s): ELDT 6100, ELDT 6110, ELDT 6130. Pre- or Co-requisite(s): ELDT 6170. Cross-listed Course(s): ELDT 8180. Instructional design is project-based work that requires leadership and management without authority. To create effective project deliverables that are in scope, cost, and of high quality, LDT team members and leaders need strong leadership and project management skills. This course will assist learners in exploring LDT leadership and project management skills through case studies and applied learning design projects using various technologies to track progress and deliverables.

ELDT 6491. Internship in Learning, Design, and Technology. (3)

Application of knowledge and skills in learning, design, and technology so as to create appropriate applications of

processes and technologies to improve learning and performance.

ELDT 6492. Capstone Project in Learning, Design, and Technology. (3)

Prerequisite(s): ELDT 6100, ELDT 6110, and ELDT 6130. Continued application of knowledge and skills in learning, design, and technology by development of the capstone project to create appropriate applications of processes and technologies to improve learning and performance.

ELDT 6800. Individual Study in Learning, Design, and Technology. (1 to 6)

Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

ELDT 8000. Topics in Learning, Design, and Technology. (1 to 6)

Variable topics in learning, design, and technology. As a doctoral course, emphasis is placed on the theories in learning, design, and technology and how the theories inform research and practice in the field. Differentiated activities and assignments are provided for doctoral students. *May be repeated for credit with change of topic and permission of department.*

ELDT 8100. Foundations of Learning, Design, and Technology. (3)

Contemporary issues and historical development of learning, design, and technology. An overview of learning theory, analysis, and design of learning environments, instructional design models, technology innovations, and factors affecting the use of technology for learning. As a doctoral course, emphasis are placed on the theories in learning, design, and technology and how the theories inform research and practice in the field. Differentiated activities and assignments are provided for doctoral students.

ELDT 8102. Research in Learning, Design, and Technology. (3)

Introduction to research topics, issues, and trends in learning, design, and technology. Focus on knowledge and skills related to examining research themes in learning, design, and technology and how theories and methods inform research and practice. Differentiated activities and assignments are provided for doctoral students to include an increased emphasis on dissertation research topics.

ELDT 8110. Instructional Design. (3)

Cross-listed Course(s): ELDT 6110. Instructional analysis, design and evaluation principles and practices; gaining practical experience applying theoretical understandings of instructional design principles and processes such as goal and task analysis, learner and context analysis, instructional strategies, selection and development of instructional materials, and formative and summative evaluation. Differentiated assignment on research in instructional multimedia development is provided for doctoral students.

ELDT 8120. Current Trends in Learning, Design, and Technology. (3) The examination of current and future trends in learning, design, and technology. Students also examine the most current literature in the field and professional organization trends and recommendations. As a doctoral course, emphasis is placed on the theories in learning, design, and technology and how the theories inform research and practice in the field. Differentiated activities and assignments are provided for doctoral students.

ELDT 8121. Advanced Instructional Design. (3) Advanced instructional design techniques; systems development; task analysis; sequencing and delivery systems.

ELDT 8130. Instructional Multimedia Development. (3) Cross-listed Course(s): ELDT 6130. Planning, developing, and evaluating instructional multimedia products based on learning principles and research-based best practices. Differentiated assignment on research in instructional multimedia development provided for doctoral students.

ELDT 8135. Learning Media, Resources and Technology. (3) Cross-listed Course(s): ELDT 6135. Selection, use, and evaluation of technological innovations in instructional media. Students learn to make professionally sound decisions in selecting appropriate processes and resources to provide optimal conditions for learning based on principles, theories, and effective practices. Differentiated assignment on research in learning media, resources and technology provided for doctoral students.

ELDT 8140. Instructional Video Development. (3) Cross-listed Course(s): ELDT 6140. Planning, developing, and evaluating instructional video products based on learning principles and research-based best practices. Doctoral students are provided a differentiated assignment to research on video development.

ELDT 8145. Visual Design of Instructional Products. (3) Cross-listed Course(s): ELDT 8145. Planning, developing, and evaluating instructional print and electronic products based on learning principles and research-based best practices. Doctoral students will be provided a differentiated, research-based assignment related to visual design, aligning with their dissertation work.

ELDT 8150. Design, Development, and Evaluation of Online Learning Systems. (3) Fundamentals of creating effective online teaching and learning systems will be covered. Topics include: research-based best practices in the design, development, and evaluation of online instruction, technological applications available to support online teaching and learning, characteristics of virtual students, instructional methodologies for online teaching and learning, and future directions of online teaching and

learning research. Differentiated assignments are provided for doctoral students.

ELDT 8160. Designing Learning Systems with Simulation and Game Technology. (3) Educational game and simulation technology learning systems. Students examine principles of game and simulation design, and current research addressing the integration and use of games and simulations in education settings. Emphasis is placed on the use of instructional design principles to identify quality characteristics of digital games and simulations, and direct the design and development of these technologies for integration in to instructional content. Differentiated assignments are provided for doctoral students.

ELDT 8170. Human Performance Technology. (3) Cross-listed Course(s): ELDT 6170. An introduction to the field of human performance technology. Examines basic concepts and principles of human performance technology, human performance system models, and various approaches to solving human performance problems. In-depth analysis of performance improvement interventions and their implementation within organizations is emphasized. Differentiated assignment on research in Human Performance Technology provided for doctoral students.

ELDT 8180. LDT Project Management and Team Leadership. (3) Cross-listed Course(s): ELDT 6180. Instructional design is project-based work that requires leadership and management without authority. To create effective project deliverables that are in scope, cost, and of high quality, Leadership, Design, and Technology (LDT) team members and leaders need strong leadership and project management skills. This course will assist learners in exploring Learning, Design, and Technology leadership and project management skills through case studies and applied learning design projects using various technologies to track progress and deliverables. Doctoral students will be required to complete differentiated, research-based work regarding LDT Project Management and/or LDT Team Leadership that will afford opportunities to make dissertation connections.

ELDT 8800. Individual Study in Learning, Design, and Technology. (1 to 6) Prerequisite(s): Permission of advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

Elementary Education (ELED)

ELED 5101. Child Development and Instructional Design for Elementary School Learners. (3) Prerequisite(s): Admission to Graduate Certificate in Elementary Education program. Models of child development and learning theories with

application for the design of instruction for elementary education learner. *Requires extensive clinical experiences.*

ELED 5110. Developing Effective Learning Environments. (2)

Prerequisite(s): Admission to Graduate Certificate in Elementary Education program. Corequisite(s): ELED 5112L and READ 5111. Using models of teaching and theories of child development as basic organizers, major instructional, organizational, management, and assessment approaches within an elementary school setting are introduced. Examination of the models, approaches, and best practices for effective curriculum integration and differentiation for all students are conducted throughout the course.

ELED 5112L. Practice-Based Teaching I Lab. (1)

Prerequisite(s): Admission to Graduate Certificate in Elementary Education program. Corequisite(s): ELED 5110 and READ 5111. Provides teacher education candidates exposure to the modeling of evidence-validated practices, the rehearsal of instructional tasks, and numerous opportunities for feedback on pedagogical decision-making.

ELED 5201. Teaching Mathematics. (3) Basic methodology in teaching mathematics from a constructivist perspective, with examination of other perspectives related to major models of teaching. Examination of the K-6 mathematics curriculum and instructional materials with reference to curriculum integration and to developmental stages of learning and the impact of diversity in mathematics instruction. Emphasis on basic, effective teaching strategies and organizational patterns expected to be used in the schools. Includes attention to prospective teachers' mathematical knowledge. *Requires extensive clinical experiences.*

ELED 5202. Integrating Curriculum for Diverse Elementary School Learners. (3) Prerequisite(s): ELED 5101. Examination of models, approaches, and best practices for effective curriculum integration for all students, including children identified with special needs, second language learners, and students performing above or below the general classroom population.

ELED 5210. Essentials of Teaching Mathematics to Elementary School Learners. (2-3) Prerequisite(s): ELED 5110 and READ 5111. Corequisite(s): ELED 5212L. Basic Methodology in teaching mathematics from a constructivist perspective, with examination of other perspectives related to major models of teaching. Examination of the K-6 mathematics curriculum and instructional materials, with reference to curriculum integration and to developmental stages of learning, and the impact of diversity in mathematics instruction. Emphasis on effective teaching strategies and organizational patterns. Includes an extensive field-based component.

ELED 5212L. Practice-Based Teaching II Lab. (1)

Prerequisite(s): ELED 5110, ELED 5112L, READ 5111, and admission to Graduate Certificate in Elementary Education program. Corequisite(s): ELED 5210 and READ 5211. Provides teacher education candidates exposure to the modeling of evidence-validated practices, the rehearsal of instructional tasks, and numerous opportunities for feedback on pedagogical decision-making.

ELED 5301. Assessing, Modifying, and Integrating Mathematics Instruction. (3)

Application, refinement, and expansion of pedagogical knowledge gained in the first mathematics pedagogy course, with focus upon assessment of student learning, evaluation of effectiveness of instruction, and modification of methods and materials for diverse learners. Closer examination of performance expectations by grade level, EOG testing, and effective instruction for struggling learners. Continued expectation for curriculum integration and use of models of teaching as an organizer for understanding instruction, assessment, and modifications. Applications of technology in mathematics instruction. Design, implementation, and evaluation of math lessons and brief mathematics-centered integrated unit. *Requires extensive clinical experiences.*

ELED 5310. Teaching and Assessment of Mathematics for Elementary School Learners. (2-3)

Prerequisite(s): ELED 5212L, ELED 5210 and READ 5211. Corequisite(s): ELED 5312L. Application and refinement/expansion of pedagogical knowledge gained in the introductory mathematics education course with focus upon assessment of student learning, evaluation of effectiveness of instruction, and modification of methods and materials for diverse learners. Closer examination of performance expectations by grade level, EOG Testing, and effective instruction for struggling learners is the focus of this course. Applications of technology and the design, implementation, and evaluation of math lessons and brief mathematics-centered integrated unit are central to mathematics instruction. Includes an extensive field-based component.

ELED 5312L. Practice-Based Teaching III Lab. (1)

Prerequisite(s): ELED 5110, ELED 5112L, ELED 5212L, ELED 5210, ELED 5212L, READ 5111, READ 5211, and admission to Graduate Certificate in Elementary Education program. Corequisite(s): ELED 5310 and READ 5311. Provides teacher education candidates exposure to the modeling of evidence-validated practices, the rehearsal of instructional tasks, and numerous opportunities for feedback on pedagogical decision-making.

ELED 5400. Teaching and Integrating Science. (3) Examines the K-6 science curriculum and instructional materials with reference to curriculum integration, developmental stages of learning, and the impact of diversity in science instruction. Emphasis on basic, effective teaching strategies

and organizational patterns expected to be used in the schools. Includes attention to prospective teachers' background knowledge as well as teaching competencies in all aspects of the K-6 NC science curriculum.

Applications of technology in science instruction. Design, implementation, and evaluation of science lessons and brief science-centered integrated unit. Evaluation of student learning and strategies for instructional modifications for diverse learners. *Requires extensive clinical experiences.*

ELED 5401. Teaching and Integrating Social Studies. (3)

Examines the K-6 social studies curriculum and instructional materials with reference to curriculum integration and to developmental stages of learning and the impact of diversity in social studies instruction. Emphasis on basic, effective teaching strategies and organizational patterns expected to be used in the schools. Includes attention to prospective teachers' background knowledge as well as teaching competencies in all aspects of the K-6 NC social studies curriculum. Applications of technology in social studies instruction. Design, implementation, and evaluation of social studies lessons and brief social studies-focused integrated unit. Evaluation of student learning and strategies for instructional modifications for diverse learners. *Requires extensive clinical experiences.*

ELED 6200. Current Issues in Global and Urban Schools. (3)

Prerequisite(s): Admission to M.Ed. in Elementary Education program or M.Ed. in Curriculum and Instruction. Candidates demonstrate an understanding of global, civic, and urban issues that impact local teaching and learning ideals. The course is reading and writing intensive as candidates are required to reflect on and analyze instruction using a variety of flexible and adaptable instructional methods appropriate for learning in a globalized educational context.

ELED 6201. Theories of Human Development and Learning in Cultural Contexts. (3)

Prerequisite(s): Admission to M.Ed. in Elementary Education program. Requires candidates to critically analyze child, adolescent, and cognitive development to determine developmental needs in an effort to design relevant yet rigorous instruction. Candidates are also required to critically examine paradigms and theories of development, conceptual relationships between education and developmental paradigms, the concepts of learning and development, and the roles and responsibilities of school staff for meeting children's developmental and cultural needs.

ELED 6202. Creating Effective Elementary Classroom

Environments for All Students. (3) Prerequisite(s): C Admission to the M.A.T. in Elementary Education; the M.Ed. in Elementary Education; or the M.Ed. in Curriculum and Instruction. Examination of theory, models, and best

practices in classroom management for all student populations. Emphasis on demonstrating best practices of classroom management models of instruction through professional development leadership.

ELED 6203. Instructional Differentiation and Leadership for 21st Century Learners. (3)

Prerequisite(s): Admission to the M.Ed. in Reading Education; M.A.T. in Elementary Education; the M.Ed. in Elementary Education; or the M.Ed. in Curriculum and Instruction Examination of models, approaches, and best practices for effective instructional differentiation for diverse learning needs of elementary school students.

ELED 6210. Current Issues in STEM Education. (3)

Examination of current issues related to Science, Technology, Engineering, and Mathematics (STEM) Education. Requires approximately 8-9 hours each week. Out-of-class work may include, but is not limited to: required reading, critical analysis of literature, research papers, and projects related to STEM issues related to elementary school learners.

ELED 6211. Integrating Engineering into the Elementary School Curriculum. (3)

An analysis of engineering concepts related to the science standards taught in Grades K-6 in North Carolina Public Schools. The Engineering is Elementary curriculum and other related resources is examined in depth. Analysis of how science, technology, and mathematics can be integrated with engineering is emphasized.

ELED 6212. Integrating Digital Learning and STEM with Elementary School Learners. (3)

Examination of digital learning (e.g., web-based tools, digital videos) to support the teaching of STEM education. Students analyze a real-world problem, analyze digital learning tools, plan and implement a lesson around the real-world problem using digital learning tools.

ELED 6213. Global Awareness in STEM Education. (3)

Examination of global awareness, humanities, and the environment in the context of STEM Education. Students research, reflect on, and apply knowledge related to Earth and the environment in relationship to issues and trends related to STEM.

ELED 6214. Designing and Developing STEM Curricula. (3)

Analysis of critical components of designing, developing, and implementing a multi-lesson unit related to a real-world issue in STEM education. Students design, teach, and assess the impact of STEM curricula that they develop. Students also design professional development around the curricula they develop.

ELED 6255. Math CAMMP. (3)

CAMMP stands for Computer Applications and Manipulative Mathematics

Program. Examination of constructivism in K-8 mathematics teaching, with emphasis on concrete, representational, and symbolic manipulatives; developmentally appropriate computer software; developmentally appropriate instructional tactics; and preparing a thematic instructional module. The course culminates in a week long practicum with elementary students.

ELED 6260. Psychological and Historical Influences on Society. (3) Cross-listed Course(s): EDCI 8260. Explores the interplay between historical events and psychological theories in shaping societies. Students will examine how social structures, cultural shifts, and human behavior influence historical developments. Through educational case studies and research, the course provides insight into the factors that drive societal change over time.

ELED 6261. Human Identity Development. (3) Cross-listed Course(s): EDCI 8260. Human identity development is a lifelong process where individuals shape a sense of self, encompassing values, beliefs, affiliations, and goals. It is a key aspect of psychosocial development as children and adolescents explore and commit to different facets of their identity. This process is influenced by various factors, including social interactions, particular contexts, and personal experiences. This course will explore human identity development with a goal of self reflection to promote successful educator effectiveness and engagement in high-need and demographically varied schools.

ELED 6262. Social Dynamics and Systems that Educate. (3) Cross-listed Course(s): EDCI 8262. Examines contemporary educational practices and explores innovative approaches to educating and learning. Students will analyze current challenges within educational systems and investigate strategies for improvement. Through critical reflection and research, participants will develop actionable plans to enhance educational outcomes.

ELED 6263. Social Action and Advocacy. (3) Cross-listed Course(s): EDCI 8263. Prerequisite(s): ELED 6260, ELED 6261, and ELED 6262. Advocacy and social action are distinct yet interconnected ways to effect change. Advocacy involves actively speaking in favor of a cause or issue, while social action encompasses a broader range of activities to create positive social change. Social action often involves mobilizing communities around schools and groups to address systemic issues and promote fairness. This class will explore the characteristics of both social and advocacy to create change in and beyond educational institutions.

ELED 6303. Teacher Inquiry and Data Analysis in the Elementary Classroom. (3) Prerequisite(s): Admission to the M.A.T or M.Ed. in Elementary Education program; and

employment as an elementary teacher. The examination of data-driven instructional decision making and the use of research to improve student learning. Requires application of advanced content knowledge, instructional planning, and student assessment data. For M.A.T. and M.Ed. students in Elementary Education only, this is a capstone experience and must be taken in the final semester of the program. .

ELED 6311. Number Systems and Operations: K-5 Mathematical Tasks. (3) Prerequisite(s): Admission to the Elementary School Mathematics Add-on Licensure or M.Ed. in Elementary Education program. Analysis and construction of effective mathematical tasks in teaching number systems and operations at the K-5 level. Attention is also given to the expansion of content knowledge.

ELED 6312. Geometry and Spatial Visualization: K-5 Assessment. (3) Prerequisite(s): ELED 6311 and admission to the Elementary School Mathematics Add-on Licensure or M.Ed. in Elementary Education program. Formative and summative assessment strategies of students' geometric thinking in elementary grades; concept development of 2- and 3-dimensional geometry. Attention also given to diagnosis of student errors.

ELED 6313. Algebraic Reasoning: K-5 Discourse and Questioning. (3) Prerequisite(s): ELED 6311 and admission to the Elementary School Mathematics Add-on Licensure or M.Ed. in Elementary Education program. Focus on the early algebra concepts of functional thinking and generalized arithmetic in relationship to pedagogical practices centered on questioning in the mathematics classroom.

ELED 6314. Rational Numbers and Operations: K-5 Learning Trajectories. (3) Prerequisite(s): ELED 6311 and admission to the Elementary School Mathematics Add-on Licensure or M.Ed. in Elementary Education program. Focus on rational number concepts through learning trajectories at the K-5 level. Attention also given to problem solving and content knowledge.

ELED 6315. Data Analysis and Measurement: K-5 Classroom Interactions. (3) Prerequisite(s): ELED 6311 and admission to the Elementary School Mathematics Add-on Licensure or M.Ed. in Elementary Education program. Focus on statistical literacy of elementary teachers and the teaching of data analysis and measurement to K-5 students. Attention is also given to learning methods which facilitate appropriate classroom interactions.

ELED 6316. Mathematical Modeling: K-5 Leadership. (3) Prerequisite(s): ELED 6311, 6312, 6313, 6314, and 6315; and admission to the Elementary School Mathematics Add-on Licensure or M.Ed. in Elementary Education program. Generating mathematical representations and making explicit connections between concepts. Pedagogy

designed to equip elementary teachers to become mathematics teacher-leaders in school settings. Focus given to topics integrated within mathematical strands.

ELED 6470. Graduate Student Teaching/Internship in Elementary Education. (5-6) Prerequisite(s): Completion of all program coursework required for eligibility to student teach, an application for the course by the established deadline, and approval of the department. Student teaching is a planned internship with a sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During the student teaching internship, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting which includes seminars. Participating students pay a course registration fee for edTPA benchmark portfolio assessment. *Graded on a Pass/Unsatisfactory basis.*

ELED 6800. Individual Study in Elementary Education. (1 to 6) Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

Engineering Management (EMGT)

EMGT 5090. Special Topics. (1 to 6) Directed study of current topics of special interest. *May be repeated for credit.*

EMGT 5114. Production Control Systems. (2) Prerequisite(s): EMGT 5201. Cross-listed Course(s): SEGR 4114. Pre- or Corequisite(s): EMGT 5202 or permission of department. Principles, analysis and design of production and inventory planning and control systems. Some of the main discussions include learning/experience curves, capacity planning, demand forecasting, aggregate production planning, inventory planning, supply chains, production scheduling, and line balancing. Practical modeling approaches including some deterministic, stochastic models and some optimization-based solution techniques in production planning are discussed. Students work on an applied term project related to production planning.

EMGT 5141. Engineering Experimental Design. (3) Cross-listed Course(s): SEGR 4141. Pre- or Corequisite(s): EMGT 5202 or permission of department. Focuses on how to achieve high-quality/low-cost systems based on Taguchi methods, design of experiments methods, and statistical analysis of data. Also includes an introduction to response surface methods.

EMGT 5142. Reliability Management and Survival Analysis. (3) Cross-listed Course(s): SEGR 4142. Pre- or Corequisite(s): EMGT 5202 or permission of department. Introduces various reliability and survival analysis techniques. Topics include: reliability/survival functions, failure/hazard rate functions; parametric/non-parametric/semi-parametric techniques; Jensen Shannon Divergence, Kullback-Leibler Divergence, and Wasserstein distance for Generative Data Modeling; Conditional Value at Risk.

EMGT 5150. Leadership Skills for Engineers. (3) Prerequisite(s): Junior standing. Focuses on skills needed to be an effective leader in business and industry in the 21st Century. The course includes an introduction to leadership styles and how they are employed in organizations. The course covers leadership skills and competencies and introduces students to the impact of AI and global communications on organization and leadership.

EMGT 5154. Bayesian Analysis for Human Decision. (3) Cross-listed Course(s): SEGR 4154. Pre- or Corequisite(s): EMGT 5202 and EMGT 5203, or permission of department. The Bayesian approach to decision-making with numerous applications in engineering, business, and healthcare. Discriminant analysis and ROC curve. Expected value maximization, decision trees, Bayes' theorem, value of information, Bayesian networks and optimal strategies. Axiomatic utility controversies and prospect theory. Theoretical and empirical determination of utility functions and relationship to human belief network. Brief introduction to multi-attribute problems, time streams, data envelopment analysis, and group decisions.

EMGT 5170. Total Quality Systems. (3) Cross-listed Course(s): SEGR 4170. Pre- or Corequisite(s): EMGT 5202 or permission of department. Applicable principles and practice in continuous quality improvement (CQI) and Total Quality Management (TQM). Statistical process control, root cause analysis, management and planning tools as well as how Generative AI can be used to enhance the effectiveness and efficiency of statistical quality control processes. All of the above are discussed through assignments and team projects. Leadership and communication skills are also a part of the class.

EMGT 5201. Fundamentals of Deterministic System Analysis. (3) Cross-listed Course(s): SEGR 4201. The course is partitioned into three modules: refresher of linear algebra with introduction to data analytics applications, continuous optimization focused on linear systems, and discrete optimization by integer programming and dynamic programming.

EMGT 5202. Fundamentals of Stochastic System Analysis. (3) Cross-listed Course(s): SEGR 4202. Pre- or Corequisite(s): EMGT 5201. The fundamentals of stochastic system analysis. The course is dissected into three

modules: (1) probability and statistics, (2) stochastic models, and (3) regression analysis.

EMGT 5203. Fundamentals of Engineering Management.

(3) Cross-listed Course(s): SEGR 4203. Pre- or Corequisite(s): EMGT 5201. The fundamentals of engineering management. The course is dissected into three modules: (1) engineering economics, (2) decision and Bayesian analysis, and (3) game theory.

EMGT 5961. Introduction to Energy Systems. (3)

Prerequisite(s): Junior standing, Basic math, economics, or consent of instructor. Overview of energy systems: energy types, generation, conversion, storage, transportation/transmission, and utilization. Principles, physical structure, processes, and utilization of fossil fuel, nuclear, and renewables for transportation, thermal, and electrical energy generation are discussed along with associated performance metrics. Also provides an introduction to environmental impacts of energy production, life-cycle analysis, energy efficiency concepts and metrics, transmission systems, grid reliability, and the impact of smart grid technologies. All topics are presented in the context of industry standards as well as federal and state regulations.

EMGT 5962. Energy Markets. (3) Cross-listed Course(s): MBAD 6962. Prerequisite(s): Basic math and economics, or permission of instructor. Energy and power systems in regulated and competitive environments and implications on business decisions for firms in these industries. Topics include: mechanism of energy markets; comparative market systems; determination of prices under different market structures; gas, oil, coal, and electricity market architecture; electricity market design; dispatch and new build decisions; smart grid and renewable energy in electricity markets; risk and risk management in energy including demand and price volatility and use of financial derivatives; and the impact of financial market trends and current and proposed policies on the energy industry.

EMGT 5963. Energy Systems Planning. (3) Prerequisite(s): Basic math and economics, or permission of instructor. Optimal planning of resources, logistics, distribution and storage in the end to end energy value chain from upstream natural gas production through mid-stream transportation and storage to downstream power generation, utility distribution and consumption. Regression, neural networks and other AI techniques for load forecasting, and optimizing generation, transmission, and distribution planning to meet the forecasted loads. Power systems reliability and control, preventive maintenance, predictive maintenance, process and service quality control.

EMGT 5964. Case Studies in the Energy Industry. (3)

Prerequisite(s): Basic math and economics, or permission of

instructor. Introduce students to interpret and analyze real world business cases in the energy sector. Cases explore the concepts behind natural monopolies, utility ownership, regulation and de-regulation, utility rates and service standards. Additionally, economic concepts such as supply and demand, market pricing, producer surplus, monopolistic pricing, and ratemaking (regulatory goals, revenue requirements and the rate base and rate cases) are applied. Some cases explore decision-making strategies surrounding marginal prices, congestion management, congestion revenue, electric and gas transmission rights both in terms of physical versus financial markets, locational marginal prices (LMP), financial transmission rights in terms of revenue adequacy and auction revenue rights and typical energy trading hedging practices.

EMGT 6090. Special Topics. (1 to 6) Directed study of current topics of special interest. *May be repeated for credit.*

EMGT 6112. Introduction to Dynamic Programming and Optimal Control. (3) Prerequisite(s): EMGT 5202. Introduces optimization over time for dynamic systems. Topics include: deterministic systems, perfect and imperfect state information, finite and infinite horizon problems, and deterministic optimal control.

EMGT 6113. Cluster Analysis and Applications. (3) Cross-listed Course(s): INES 8090. Prerequisite(s): EMGT 5201 or permission of instructor. Cluster analysis is an unsupervised machine learning technique applicable to many fields. This course introduces several important clustering algorithms and their applications in marketing, forecasting, ranking, pattern recognition, etc.

EMGT 6116. System Identification and Reinforcement Learning. (3) Prerequisite(s): EMGT 5202 or permission of instructor. In-depth exploration of behavioral applications to optimal control and reinforcement learning theory. Topics include: Riccati equation; Kalman Filter; Neuro-dynamic Programming; Reinforcement Learning; and Generative Adversarial Network.

EMGT 6142. Quality and Manufacturing Management. (3) Provides an in-depth study of current issues and advances in manufacturing management. Topics include: just-in-time inventory management, total quality management, statistical process control, continuous improvement, flexible manufacturing systems, computer-integrated manufacturing, technology evaluation and selection, and manufacturing strategy. Emphasis on use of computers for decision support.

EMGT 6890. Individual Study. (1 to 6) Individual investigation and exposition of results. *May be repeated for credit.*

EMGT 6891. Engineering Management Project I. (1)

Prerequisite(s): Minimum two courses from EMGT 5201, EMGT 5202, EMGT 5203; Department approval is required; At least 21 credit hours must be completed or currently enrolled in. The first-term capstone project in a series of two project courses for the students in the M.S. in Engineering Management program. A data-driven, real-world industry or business project is proposed and carried out by individual students under the guidance of a faculty member. The project topics emphasize the design and implementation of effective methods on the development and/or improvement of products, processes, procedures, or systems. *May be repeated with change of topic and mentor.*

EMGT 6892. Engineering Management Project II. (2)

Prerequisite(s): EMGT 6891 with a grade B or better; 9 or less credit hours remain to complete the MS in Engineering Management degree. The second-term capstone project in a series of two project courses for students in the M.S. in Engineering Management program. The project problem from Engineering Management Project I is continued by individual students under the guidance of a faculty member.

EMGT 6901. Advanced Project Management. (3)

Prerequisite(s): Permission of Instructor. Study of various aspects of project management including project types and organizations, regulatory and liability issues, planning, budget, risk assessment, and conflict resolution. Exercises involve research into emerging management processes, use of computerized techniques, and application of management theories in team-based projects.

EMGT 6902. Legal Issues in Engineering Management. (3)

Survey of legal issues surrounding engineering products and services, including warranty, liability, contracting, intellectual property, codes, and accepted practice. Legal principles, precedents, case studies, and research projects.

EMGT 6905. Designed Experimentation. (3)

Prerequisite(s): Statistics and permission of instructor. Response Surface Methodology (RSM), sequential experiments, robust parameter design and tolerance design techniques are introduced. By careful design of experiments, the objective is to optimize a response (output variable) that is influenced by several independent variables (input variables). Generative artificial intelligence will be used for comparison of RSM for derivative estimations, including Moving Least Squares, Kriging and Radial Basis Functions.

EMGT 6906. Processing Systems Simulation. (3)

Prerequisite(s): Statistics. Principles and application of selecting, planning, and executing simulation projects for processing systems, and developing and experimenting with simulation models. Discrete event simulation is

particularly powerful for modeling and experimenting with systems exhibiting interdependencies and variability - such as manufacturing and service systems. Students learn simulation project management, modeling, and experimenting using commercial simulation software products.

EMGT 6910. Forecasting Techniques, Methodologies, and Practice. (3)

Cross-listed Course(s): INES 8090. Prerequisite(s): EMGT 5202 or permission of instructor. A comprehensive introduction to forecasting techniques and methodologies that offers practical guidance to apply them in the real-world decision-making processes. The techniques may include, but are not limited to: time series analysis, regression analysis, artificial neural networks, and other artificial intelligence and machine learning techniques. The methodologies may include, but are not limited to: forecast combination, hierarchical forecasting, probabilistic forecasting, judgmental forecasting, and technological forecasting. The applications may include, but are not limited to: energy forecasting, retail forecasting, healthcare forecasting, tourism forecasting, sports forecasting, and new product forecasting.

EMGT 6912. Computational Intelligence. (3)

Cross-listed Course(s): INES 8090. Prerequisite(s): EMGT 5201 or permission of instructor. Computational intelligence, a.k.a. soft computing, is the use of inexact solutions to computationally hard tasks such as the solution of NP-complete problems. This course provides a comprehensive introduction to computational intelligence techniques and their applications in solving optimization problems and complex real-world problems. The techniques may include, but are not limited to: fuzzy logic and fuzzy systems, neural networks and deep neural networks, support vector machines, genetic algorithms, metaheuristics and swarm intelligence, and Bayesian network.

EMGT 6915. Engineering Decision and Risk Analysis. (3)

Prerequisite(s): Integral and Differential Calculus, Statistics, Probability, or permission of instructor. Useful tools for analyzing difficult decisions and making the right choice. After introducing components and challenges of decision making, the course proceeds with the discussion of structuring decisions using decision trees and influence diagrams. Decision making under uncertainty is emphasized including maximax, maximin, and minimax regret techniques. Modeling of different risk attitudes based on risk and return tradeoffs are analyzed through utility theory. Finally, decisions under conflicting objectives and multiple criteria are discussed along with some introduction to game theory.

EMGT 6920. Logistics Engineering and Management. (3)

Prerequisite(s): Permission of instructor. Introduces logistics systems from a systems engineering perspective. It starts

from the design of effective and efficient systems with their respective maintenance and support infrastructures to the coordination of the production and distribution of systems and products for customer use at different stages of a final product's life cycle. The emphasis is on the design and implementation of effective and efficient logistics systems and supply chains. Contents also include the current management issues in logistics systems implementation and supply chain operations.

EMGT 6924. Lean Six Sigma Practice and Management. (3)

Provides an understanding of the Lean Six Sigma system design principles and tools. Discusses the lean continuous improvement cycle: 1) defining value using tools such as Quality Function Deployment; 2) proceeding with identifying value streams using Value Stream Mapping; 3) making the value stream flow through the elimination of 7 wastes, line balancing, 5S, cellular layouts, SMED; 4) pulling resources JIT based on demand; and 5) achieving perfection through Kaizen events and statistical process control. Six Sigma improvement cycles DMAIC (Define, Measure, Analyze, Measure and Control) and DMADV (Define, Measure, Analyze, Design and Verify) are also discussed and synergies with lean principles are reviewed to create a Lean Six Sigma system. Students are exposed to industry cases from major companies that illustrate the challenges and best practices of implementing a Lean Six Sigma system.

EMGT 6926. Supply Network Analysis. (3) Builds fundamental systems skills to effectively design, plan, and execute supply networks that deliver value to customers. Principles do not only apply to manufacturing but to service organizations as well. This course helps students understand the principles of supply chain management, and provides them with the related tools and techniques to make supply chains and companies deliver goods and services successfully.

EMGT 6930. Capital Cost Estimating. (3) Prerequisite(s): Permission of instructor. Provides in-depth study of cost management issues in a technological business environment. It covers cost concepts including project evaluation techniques based on cost, capital planning and budgeting, investment evaluation under risk and uncertainty, rate of return methods, estimating for economic analyses, inflation effects, depreciation and income taxes, and capital investment decision analysis. Private and public sector cost issues are also discussed. The tools and techniques presented are useful for engineering, business, or management professionals of any organization. Students learn how to use the course material for effective project management, budgeting, and decision making.

EMGT 6950. Engineering Systems Integration. (3)

Prerequisite(s): Permission of instructor. An introduction to

the relevant issues and required techniques for successful systems design development, integration, management, and implementation. Principles and methods for system life-cycle analysis, system planning and management, and systems integration. Interfaces between the system, subsystems, the environment, and people. Students learn the factors to control the total system development process designed to ensure a high quality and effective system.

EMGT 6952. Engineering Systems Optimization. (3)

Cross-listed Course(s): INES 8090. Prerequisite(s): Calculus and Linear Algebra or permission of instructor. Develops fundamental problem-solving skills for engineers and engineering managers using techniques for optimizing engineering systems, with focuses on nonlinear optimization. Convex analysis, optimality conditions, unconstrained optimization, and constrained optimization are emphasized. Applications in statistical learning and machine learning are discussed.

EMGT 6955. Systems Reliability Engineering. (3)

Prerequisite(s): Calculus and Statistics. Introduction of concepts and methods for the design, testing and estimation of component and system reliabilities. Topics include: reliability mathematics; analysis of reliability data; reliability prediction and modeling; reliability testing; maintainability and availability; failure mode and effects analysis and failure rates; reliability design and implementation; application of concurrent engineering and reliability methods to integrate reliability tests into the overall system development cycle to reduce overall life cycle costs.

EMGT 6965. Energy Analytics. (3) Prerequisite(s): EMGT 5202 or permission of instructor. Energy analytics is an interdisciplinary area applying techniques and methodologies of economics, statistics, electrical engineering, artificial intelligence and machine learning to solve real-world analytical problems in the energy industry. Designed for current and future analysts, operators, planners and their managers in the energy industry. Covers major energy-related applications of descriptive, predictive and prescriptive analytics. Topics include: energy data analysis, load forecasting, price forecasting, renewable generation forecasting, energy trading and risk management, demand response and customer analytics, and utilities outage analytics.

EMGT 6980. Industrial and Technology Management

Seminars. (1) Prerequisite(s): Permission of instructor. A series of seminars covering current management issues, challenges and practices in industrial, government, and business sectors of industry. *May be repeated for credit.* (All students in the M.S. in Engineering Management program are required to take this course within the first or second semester of the program.)

EMGT 6985. Engineering Management Project. (3)

Prerequisite(s): EMGT 6980 and two other program required EMGT courses. A data-driven, real world industrial/business project. Emphasizes the design and implementation of effective methods on the development and/or improvement of products, processes, procedures, or systems. A 3-member project committee which includes at least two faculty members from the Department of Systems Engineering and Engineering Management has to be established before taking this project course. This project is a capstone project for the students in the M.S. in Engineering Management program.

EMGT 6990. Industrial Internship. (1 to 3) Prerequisite(s):

Completion of 9 credit hours of graduate coursework. Full- or part-time academic year internship in engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by their graduate program director. Requires a mid-term report and final report to be submitted.

EMGT 6991. Graduate Master Thesis Research. (1 to 6)

Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

English (ENGL)

ENGL 5002. Women and Literature. (3) Selected topics focusing on women and literature, such as images of women, women as writers, and women as literary critics. *May be repeated for credit with change of topic and permission of department.* (However, only six hours may be used for the requirements for the English major.)

ENGL 5008. Topics in Advanced Technical

Communication. (3) Exploration, both theoretically and practically, of the interrelation of written, oral, graphic, and digital communication within technical rhetorical contexts. *May be repeated for credit one time with permission of department.*

ENGL 5050. Topics in English. (3) Special topics not included in other courses. Writing topic. *May be repeated for credit with permission of department.*

ENGL 5072. Topics in Literature and Film. (3) Cross-listed Course(s): ENGL 4072. Selected topics in literature and film. *May be repeated for credit with change of topic.*

ENGL 5074. Topics in Children's Literature, Media, and Culture. (3) Cross-listed Course(s): ENGL 4074. Selected topics in children's literature and culture. *May be repeated for credit with change of topic.*

ENGL 5075. Topics in Linguistics. (3) Selected topics in linguistics. *May be repeated for credit with change of topic.*

ENGL 5077. Topics in Rhetoric and Composition. (3). Cross-listed Course(s): ENGL 4077. Selected topics in rhetoric and composition. *May be repeated for credit with change of topic.*

ENGL 5078. Special Topics in Poetry Writing. (3) Designed for advanced writers of poetry to further develop their skills, styles, and aesthetics. Intensive study of select areas of form or genre with continued practice in the writing of poetry. *May be repeated for credit one time with permission of department.*

ENGL 5079. Special Topics in Fiction Writing. (3) Designed for advanced writers of fiction to further develop their skills, styles, and aesthetics. Intensive study of select areas of form or genre with continued practice in the writing of fiction. *May be repeated for credit one time with permission of department.*

ENGL 5102. British Children's Literature. (3) Focuses on works in British and British Colonial Children's Literature. *May be repeated for credit with change of topic.*

ENGL 5103. American Children's Literature. (3) Focuses on works in American Children's Literature. *May be repeated for credit with change of topic.*

ENGL 5104. Multiculturalism and Children's Literature. (3) Focuses on works that represent one or more kinds of cultural, ethnic, or social diversity of the United States and other national literatures. *May be repeated for credit with change of topic.*

ENGL 5116. Shakespeare's Early Plays. (3) A study of 10 representative plays from the comedies, histories and tragedies written 1590-1600.

ENGL 5117. Shakespeare's Late Plays. (3) A study of 10 representative plays from the period 1600-1611, including the late tragedies and tragi-comedies.

ENGL 5132. British Drama to 1642. (3) Cross-listed Course(s): ENGL 4132. A survey of late-medieval and Renaissance drama in England.

ENGL 5151. Drama. (3) Cross-listed Course(s): ENGL 4151. Drama written in English, focusing on a particular period,

nationality, or topic. *May be repeated for credit one time with change of topic.*

ENGL 5161. Modern English Grammar. (3) A study of the structure of contemporary English, with an emphasis on descriptive approaches.

ENGL 5165. Multiculturalism and Language. (3) Readings in and discussion and application of the interrelationships between language and culture, including basic introduction to contemporary American dialects and to social contexts of language.

ENGL 5167. The Mind and Language. (3) Introduction to the study of the mind from a linguistic perspective. Topics include: language growth and loss; language deficits; modularity and hierarchical processing; the interaction of cognitive and linguistic faculties; parsing/processing strategies; and limitations and applications such as therapy, forensics, computing, and teaching.

ENGL 5168. Multimodality and Text Description. (3) Cross-listed Course(s): ENGL 4168. Explores how different modes of communication interact and are integrated in adapted, new or emergent digital discourses and genres. Multimodal analysis includes the analysis of communication in all its forms, but is particularly concerned with texts in which two or more semiotic resources-or 'modes' of communication-are integrated and combined. Such resources include aspects of speech such as intonation and other vocal characteristics, gesture (face, hand, and body) and proxemics, as well as products of human technology such as carving, painting, writing, architecture, image, sound recording, and interactive computing resources.

ENGL 5181. Writing and Designing User Documents. (3) Researching and analyzing audiences to write publishable instructions. This includes the production, testing, and revision of tutorials, reference manuals, online documents, and digital media for users of computers and other technologies.

ENGL 5182. Information Design and Digital Publishing. (3) Theoretical and practical exploration of visual communication. By rhetorically integrating text and graphics, students will write and publish documents and online content for digital environments.

ENGL 5183. Editing with Digital Technologies. (3) Substantive editing, copyediting, project management, and editing in hardcopy documents and web and digital environments.

ENGL 5200. Teaching of Writing. (3) Cross-listed Course(s): ENGL 4200. Introduction to various theories that inform

practices in the teaching of writing and methods of teaching writing to middle and secondary learners.

ENGL 5202. Advanced Poetry Writing. (3) Cross-listed Course(s): ENGL 4202. Designed for advanced writers of poetry to further develop their skills, styles, and aesthetics. Combines reading and discussion of published contemporary poetry with the writing of original creative works. *May be repeated for credit one time with permission of department.*

ENGL 5203. Advanced Fiction Writing. (3) Cross-listed Course(s): ENGL 4203. Designed for advanced writers of fiction to further develop their skills, styles, and aesthetics. Combines reading and discussion of published contemporary fiction with the writing of original creative works. *May be repeated for credit one time with permission of department.*

ENGL 5204. Expository Writing. (3) Writing of essays, criticism, and various forms of exposition.

ENGL 5205. Advanced Expository Writing. (3) Prerequisite(s): ENGL 5204. Advanced writing of essays, criticism, and various forms of exposition. *May be repeated for credit one time with permission of department.*

ENGL 5206. Advanced Creative Nonfiction Writing. (3) Cross-listed Course(s): ENGL 4206. Designed for advanced writers of creative nonfiction to further develop their skills, styles, and aesthetics. Combines the reading and discussion of published contemporary creative nonfiction with the writing of original creative works. *May be repeated for credit one time with permission of department.*

ENGL 5207 Writing Young Adult Fiction. (3) Cross-listed Course(s): ENGL 4207. Today, the young adult (YA) novel is often a beautifully crafted work of literary fiction open to a variety of experimental approaches. This course serves those who already write, or would like to try writing, YA fiction. It explores aspects of reading and writing young adult fiction, including developing a narrative point of view, trajectory and conflict, creating complex characters, and issues of voice and style. *May be repeated for credit with change of topic.*

ENGL 5235. History of the Book. (3) Cross-listed Course(s): ENGL 4235. Explorations of the development, technologies, cultures, and impact of the book and print media.

ENGL 5254. Teaching English/Communications Skills to Middle and Secondary School Learners. (3) Cross-listed Course(s): ENGL 4254. Prerequisite(s): MDSK 5204 and MDSK 6162. Pre- or Corequisite(s): FLED 5105. Approaches to the teaching of English, including recent theories and

research related to writing and literary study, designed primarily for teaching in grades 6-12.

ENGL 5260. History of the Global Englishes. (3) Cross-listed Course(s): ENGL 4260. Origins and development of the English language, both spoken and written, from its earliest forms to contemporary usage.

ENGL 5262. Language and Diversity. (3) Cross-listed Course(s): ENGL 4262. Examination of contemporary American varieties of English by region, gender, ethnic identity, socioeconomic status, age, social networks, and other cultural groupings.

ENGL 5270. Studies in Writing, Rhetoric, and Literacy. (3) Cross-listed Course(s): ENGL 4270. Studies of writing, rhetoric, and literacy with an emphasis on historical and cultural contexts. *May be repeated for credit with change of topic and permission of department.*

ENGL 5271. Studies in Writing, Rhetoric, and New Media. (3) Cross-listed Course(s): ENGL 4271. Studies of writing, rhetoric, and new media and digital technologies with an emphasis on historical and cultural contexts.

ENGL 5272. Studies in the Politics of Language and Writing. (3) Cross-listed Course(s): ENGL 4272. Explores language and writing as sites of political contestation in local, national, and global contexts. Examines theoretical debates and effects of politics and history on language and learning.

ENGL 5274. Visual Rhetoric. (3) Cross-listed Course(s): ENGL 4274. Theory and practice of crafting rhetorical arguments in print and electronic media that depend upon visual exhibits, such as drawings, photographs, tables, graphs, icons, and videos.

ENGL 5275. Rhetoric and Technology. (3) Cross-listed Course(s): ENGL 4275. Research and theories of the rhetorical construction of technology in history and culture.

ENGL 5277. Digital Literacies. (3) Cross-listed Course(s): ENGL 4277. Exploration of the intersections between evolving digital literacies and traditional school-based literacies.

ENGL 5280. Writing about Place. (3) Cross-listed Course(s): ENGL 4051. As writers of nonfiction, students write about specific places by researching their histories and imagining their futures, whether those places are preserved, threatened, stagnant, or revitalized. Through drafting, editing, and multiple revisions, students produce illustrated work suitable for publication consideration.

ENGL 5290. Advanced Creative Project. (3) The planning, writing, and polishing of a work of at least 20 pages of

poetry or at least 40 pages of fiction or creative non-fiction with the guidance of a member of the Department's creative writing faculty. The final work may be a single piece or a collection of pieces and will evolve under the supervision of the primary instructor. With permission of the department, students who took the course as undergraduates may repeat as graduate students.

ENGL 5325. Trauma and Memory in Contemporary American Literature. (3) Cross-listed Course(s): ENGL 4325. Examination of selected works that explore national experiences of trauma in the U.S.

ENGL 5400. Research, Theory, and Practice of Tutoring Writing. (3) Cross-listed Course(s): ENGL 4400 and WRDS 4402. Prerequisite(s): Interview and permission of Writing Resources Center Director and/or Assistant Director. A practicum which educates student peer tutors to assist writers in UNC Charlotte's Writing Resources Center (WRC). All writing consultants are required to complete this course, which provides an introduction to writing center research, theory, and practice. Coursework explores the history, contexts, and research-based principles of writing centers; the social, collaborative nature of learning; strategies of one-with-one writing instruction; threshold concepts in Writing Studies; composition theory; and current issues in writing pedagogy, such as linguistic justice and accessibility. Significant attention is given to research-based practices for supporting multilingual writers. In addition to completing coursework, students tutor in the WRC for three hours per week. Because this course includes a practicum in the WRC, enrollment is by permission only, following a successful interview with the Director and/or Associate Director of the WRC.

ENGL 5410. Professional Internship. (3, 6) Prerequisite(s): Permission of English Internship Coordinator; Junior, Senior, or Graduate standing; English major, English minor, or Communication Studies minor; minimum 2.5 GPA; and a course in professional communication (e.g., journalism, technical communication, public relations, public relations lab, or mass media). Students work 8-10 hours (for 3 credit hours) or 16-20 hours (for 6 credit hours) per week in a placement arranged by the Internship coordinator. Only three credit hours may be applied to the English major at either the undergraduate or graduate level; three additional hours may be counted as a University or Communications elective.

ENGL 6008. Topics in Advanced Technical Communication. (3) Theoretical and practical exploration of advanced topics in technical communication, including projects in which students write and publish documents by rhetorically integrating text, graphics, and other media

using computer aids. *May be repeated for credit with change of topic.*

ENGL 6062. Topics in Rhetoric. (3) Examination of and/or research concerning selected issues in rhetorical theory or pedagogy. *May be repeated for credit with change of topic and permission of department.*

ENGL 6070. Topics in English. (3) Selected topics of literature, rhetoric/writing, and language. *May be repeated for credit with change of topic and permission of department.*

ENGL 6072. Topics in Literature and Film. (3) Selected topics in literature and film. *May be repeated for credit with change of topic.*

ENGL 6073. Topics in Creative Writing. (3) Selected topics in creative writing. *May be repeated for credit with change of topic.*

ENGL 6101. Introduction to Literary Studies. (3) Introductory study of reading, interpreting, researching, and writing about literature. Required of all M.A. in English students, preferably at or near the beginning of their programs.

ENGL 6103. Introduction to Children's Literature and Culture. (3) Covers a range of texts for children and adolescents, including both historical and contemporary works.

ENGL 6104. Major Figures and Themes in Children's Literature. (3) Cross-listed Course(s): EDCI 8133. Focuses on significant authors, illustrators, or themes in children's and/or adolescent literature. *May be repeated for credit with change of topic and permission of department.*

ENGL 6112. Shakespeare's Tragedies. (3) Source materials, textual problems and stage conventions of the great tragedies, illustrating Shakespeare's dramaturgy.

ENGL 6116. Technical/Professional Writing. (3)
Prerequisite(s): Graduate or Post-Baccalaureate Graduate standing. An introduction to the theoretical and practical exploration of key issues and developments in the field of technical/professional writing. Students will write and publish print and online documents by rhetorically integrating text and graphics. Students in the Technical/Professional Writing Concentration are expected to enroll in 6116 as their first or second course in the program.

ENGL 6125. The Romantic Era, 1785-1832. (3) Development of the Romantic movement, with emphasis on the works of Wordsworth, Coleridge and other major poets.

ENGL 6127. Seminar in Language, Culture, and Society. (3)
Recommended Prerequisite(s): an introductory course in linguistics. Discussions on topics such as the complex relationships between language and culture, how language affects perception and cognition, and how language affects the individual's sense of self and the group's sense of community.

ENGL 6141. American Romanticism. (3) Major writers of the 1830s, 40s, and 50s, including Hawthorne, Melville, Whitman, Emerson, Thoreau, and the Transcendental Movement.

ENGL 6142. American Realism and Naturalism. (3) Major writers of the two movements before and after the end of the 19th century, including Twain, Howells, James, Crane, Dreiser, Norris.

ENGL 6147. Perspectives in African American Literature. (3)
Cross-listed Course(s): EDCI 8134. A survey of African American literature, emphasizing the major authors, those relevant historical and social factors, and those specific literary movements that have influenced the development of African American literature.

ENGL 6160. Introduction to the English Language. (3)
History and nature of English, its grammar, syntax, and lexicon. Integrates the study of language-based rhetorical and literary theory, asks students to consider the nature of language in general, its impact on the user, and the development of the systems of English, concentrating on features of major British and American dialects and registers. Required of all M.A. in English students, preferably at or near the beginning of their programs.

ENGL 6161. Introduction to Linguistics. (3) Introduction to linguistics, its techniques and objectives, descriptive and historical approaches, language families, language and culture.

ENGL 6163. Understanding Language Learning: Mind, Identity, and the Sociocultural World. (3) Prerequisite(s): ENGL 6160 or permission of instructor. Theories of language learning processes and their intersection with mind, identity, and sociocultural contexts. Credit will not be given for ENGL 6163 where credit has been given for ENGL 4263.

ENGL 6164. Comparative Language Analysis for Teachers. (3) An introduction to the theory and practice of contrastive language analysis. Examination of universal features of the process of second language acquisition and the effects of a learner's first language on the acquisition of a second language, and explore how teachers can use such knowledge to facilitate the learner's acquisition of a second language.

ENGL 6165. Introduction to English for Specific Purposes. (3) An introduction to learner-centered approaches to teaching English as a Second Language (ESL) and English as a Foreign Language (EFL) to non-native learners who need to learn English for a very definite academic, professional or vocational purpose.

ENGL 6166. Rhetorical Theory. (3) Rhetorical theories, past and present, focusing on ways that these varied frameworks of understanding have informed the generation, understanding, and pedagogy of writing and other modes of discourse. Emphases vary from semester to semester, readings concentrate on major selected rhetorical theories and on implications of these theories for the understanding and pedagogy of discourse.

ENGL 6167. Research Methods in Applied Linguistics. (3) Prerequisite(s): ENGL 6161 or permission of instructor. An introduction to the major components of designing and carrying out a research project in applied linguistics.

ENGL 6168. Practicum in English for Specific Purposes. (3) Prerequisite(s): Permission of the Graduate Program Director. Provides supervised experiences in teaching in an educational setting outside the public schools with an emphasis on developing skills as an education professional.

ENGL 6181. Composition Theory and Pedagogy. (3) An introduction to various theories that shape composition and its teaching.

ENGL 6182. Research Theory and Method in Rhetoric and Composition. (3) An exploration of research in Rhetoric and Composition Studies, including various methods of conducting research and their implications for knowledge-making in the field.

ENGL 6183. Critical Pedagogy and the Teaching of Writing. (3) Explores how ideologies and ideas of literacy shape practices in the teaching of writing.

ENGL 6195. Teaching College English. (3) Examination of major issues in the theory and practice of literature and composition instruction at the college level.

ENGL 6274. Contexts and Issues in the Teaching of English. (3) Prerequisite(s): Admission to the Program. Examine key concepts of the discipline. In doing so, students consider their own identities as readers, writers, teachers, researchers, and makers of meaning. Emphasizes critical approaches and pedagogical issues, with special attention given to technology in the teaching of language, composition, and literature, as well as cultural contexts for the study of English.

ENGL 6495. Internship in College Teaching. (3) Prerequisite(s): ENGL 6195. Teaching in one section offered

by the Department of English under the supervision of English faculty. Students will be accepted for internship only near the end of the degree program and upon approval of the Department. Students will be assigned to teach selected basic courses, and also will participate in periodic conferences and seminars. It is strongly recommended that students also take ENGL 4400 before ENGL 6195.

ENGL 6496. Practicum in Teaching College English. (1) Prerequisite(s): Permission of Graduate Program Director. Practicum designed to prepare students to teach courses in English studies. *Graded on a Pass/Unsatisfactory basis.*

ENGL 6674. Applied Research Methods in the Teaching of English. (3) Cross-listed Course(s): EDCI 8121. Provides the opportunity to apply research methods in classrooms. Examine identities as readers, writers, teachers, and especially as classroom researchers.

ENGL 6680. Seminar in British Literature. (3) Study of a topic in British Literature. *May be repeated for credit with change of topic.*

ENGL 6685. Seminar in American Literature. (3) Study of a topic in American Literature. *May be repeated for credit with change of topic.*

ENGL 6687. Seminar in Global Literature. (3) Study of a topic in global literature. *May be repeated for credit with change of topic.*

ENGL 6890. Directed Reading. (1 to 3) An independent study of a topic in English that a student arranges individually with their graduate program director.

ENGL 6895. Project. (3) Appropriate research and written exposition of that research, which may or may not be an outgrowth of work done in previous courses. If the project is the outgrowth of previous coursework, additional research and exposition must be done beyond that previously undertaken. Based on a written proposal from the student, the project is directed by a graduate faculty member appropriate to the topic, appointed by the Graduate Program Director after consultation with the student, and defended before three graduate faculty members. It is recommended that project work not be undertaken until near the end of the student's program. A Creative project option is available for students who have completed appropriate coursework in Creative Writing. A statement of recommendations and requirements for form and procedures is available in the Department of English. *May be repeated for credit three times for students in the M.A./M.F.A. dual degree program.*

ENGL 6974. Thesis/Project in the Teaching of English. (6) Prerequisite(s): Permission of the department. Research

integrating the fields of English and Education in a theoretical or application-oriented study. If the thesis/project is the outgrowth of previous coursework, considerable additional research and exposition must be done.

ENGL 6995. Thesis Preparation. (3) Students completing the thesis over the course of two semesters will take this course in the semester before they take ENGL 6996. Appropriate research and written exposition of that research, which may or may not be an outgrowth of work done in previous courses. If the thesis is the outgrowth of previous coursework, considerable additional research and exposition must be done beyond that previously undertaken. The proposed thesis work, as well as the final product, will be approved by a committee of three graduate faculty appropriate to the topic, appointed by the Graduate Program Director after consultation with the student, on the basis of a written proposal from the student. It is recommended that thesis work not be undertaken until near the end of the student's program. The thesis title is to be shown on the student's final transcript. A Creative thesis option is available for students who have completed appropriate coursework in Creative Writing. (A statement of recommendations and requirements for form and procedures is available in the Department of English.)

ENGL 6996. Thesis. (3 or 6) Appropriate research and written exposition of that research, which may or may not be an outgrowth of work done in previous courses. If the thesis is the outgrowth of previous coursework, considerable additional research and exposition must be done beyond that previously undertaken. The proposed thesis work, as well as the final product, is approved by a committee of three graduate faculty appropriate to the topic, appointed by the Graduate Program Director after consultation with the student, on the basis of a written proposal from the student. It is recommended that thesis work not be undertaken until near the end of the student's program. The thesis title is to be shown on the student's final transcript. A Creative thesis option is available for students who have completed appropriate coursework in Creative Writing. A statement of recommendations and requirements for form and procedures is available in the Department of English. *Graded on a Standard Letter Grade basis each term.*

Engineering (ENGR)

ENGR 5090. Special Topics. (1 to 4) Directed study of current topics of special interest. *May be repeated for credit.*

Epidemiology (EPID)

EPID 8202. Introduction to Data Management. (3)

Introduces best practices in data manipulation and data analysis in epidemiological research. Students will learn practical skills in data management using statistical software packages such as SAS, SQL, Stata, R or others. Topics such as data storage, data security, data visualization, and data wrangling will also be covered.

EPID 8272. Survival Analysis. (3) Prerequisite(s): HLTH 8270.

Introduces core concepts and methods in survival analysis and modeling of time-to-event and censored data that are commonly used in epidemiologic research.

EPID 8273. Multilevel and Longitudinal Data Analysis. (3)

Prerequisite(s): HLTH 8270. Introduces statistical methods such as linear and logistic regression used for the analysis of multilevel and longitudinal data in epidemiologic research. Students will learn to contrast conventional statistical methods focusing on single time points from multilevel and longitudinal models. Topics also include random effects and growth curve models.

EPID 8274. Advanced Methods in Epidemiology. (3)

Prerequisite(s): HLTH 6211. Introduces students to advanced epidemiological principles to design, conduct, analyze, and interpret epidemiologic studies. Students will learn how to critically appraise published epidemiological research. Topics such as measures of association, confounding, bias, causal inference, directed acyclic graphs, effect modification, and missing data will be covered.

EPID 8275. Spatial Epidemiology. (3) Prerequisite(s): HLTH 8270.

Students will learn to use geographic information systems for disease mapping and cluster detection. Topics include geostatistical, lattice, and point process data, spatial correlations, descriptive analysis for spatial data, regressions with spatial random effects, model evaluations, and space-time analyses. The emphasis is on the application of spatial methods to analyze public health and epidemiologic problems.

EPID 8276. Systematic Reviews and Meta-Analysis. (3)

Prerequisite(s): Permission of instructor. Prepares students to systematically appraise evidence by synthesizing primary research studies on an epidemiologic topic of interest. Topics include: selecting an appropriate research question, relevant study designs, minimizing bias, data visualization techniques, and common problems in systematic reviews and meta-analyses.

Earth Sciences (ESCI)

ESCI 5000. Selected Topics in Earth Sciences. (1 to 4)

Prerequisite(s): ESCI 1101, GEOL 1200 and GEOL 1200L, or permission of instructor. In-depth treatment of specific topics selected from one of the fields of the earth sciences. *May be repeated for credit with change of topic.*

ESCI 5105. Meteorological Computer Applications. (3)

Prerequisite(s): METR 3140 and MATH 1241 with grades of C or above, or permission of instructor. Principles of computer programming applied to the analysis of meteorological data. Students become familiar with the Unix environment, learn programming basics, and create programs to analyze various meteorological datasets. Topics include: program composition, compiling, data types, mathematical operators, selective execution, repetitive execution, arrays, functions, and subroutines. Three hours of combined lecture and lab per week.

ESCI 5110. Atmospheric Instrumentation. (3) Prerequisite(s):

METR 3210 with a grade of C or above, or permission of the instructor. An overview of common atmospheric measurements systems and their applications. Particular attention is paid to surface, sounding, radar, and satellite systems. Three hours of combined lecture and lab per week.

ESCI 5122. Statistics and Data Analysis in Earth Sciences. (3)

Cross-listed Course(s): ESCI 4122. Prerequisite(s): Permission of instructor. Develop techniques in a programming environment to quantitatively summarize spatiotemporal data related to Earth sciences using univariate and bivariate statistical calculations; defend interpretations of spatiotemporal Earth science data from both statistical and physical perspectives.

ESCI 5140. Hydrologic Processes. (4) Prerequisite(s): ESCI

1101; GEOL 1200 and GEOL 1200L; or permission of instructor. Atmospheric, soils and geologic aspects of surface and ground water processes. Three lecture hours and one three-hour lab per week.

ESCI 5145. Groundwater. (4) Prerequisite(s): Graduate

standing in an M.S. program or permission of the instructor. Cross-listed Course(s): ESCI 4145. Physical and chemical groundwater hydrology, study of aquifer solids, and the role of groundwater in environmental sustainability. Water balance, flow, transport, and chemical reactions in aquifers, including groundwater interactions with other parts of the hydrologic cycle. Three hours of lecture and three hours of lab per week, with occasional field trips.

ESCI 5150. Applied Climatology. (3) Prerequisite(s): METR

3250 or permission of instructor. Methods of acquiring and analyzing climatic data in various types of applied

problems. Emphasis on methods to assess and reduce the impact of weather and climate upon human activities. Three hours of combined lecture and lab per week.

ESCI 5155. Fluvial Processes. (4) Prerequisite(s): ESCI 1101 and

ESCI 1101L; GEOL 1200 and GEOL 1200L; or permission of instructor. Hydrologic and geomorphic study of the transport of water and earth materials within stream systems. Erosion, mass wasting, open channel flow, sediment transport, flooding, stream channel morphology, morphometry of drainage basins, and related topics. Three lecture hours, three lab hours per week.

ESCI 5170. Fundamentals of Remote Sensing. (4)

Prerequisite(s): ESCI 1101 and GEOL 1200, or permission of instructor. Introduces the physical fundamentals of remote sensing, provides an overview of airborne and satellite remote sensing systems, and offers a basic instruction in the use and interpretation of remote sensing imagery. Identification, interpretation and mapping of both natural and cultural landscape features are also covered. One 2-1/2 hour lecture and one three-hour lab per week.

ESCI 5180. Digital Image Processing in Remote Sensing. (4)

Offers both a basic instruction in the use and interpretation of remote sensing data, and advanced remote sensing techniques to help students understand what and how remote sensing can contribute to the information needs in various fields. 2-1/2 lecture hours and three lab hours per week.

ESCI 5190. Contemporary Environmental Issues. (3) Cross-

listed Course(s): ESCI 4190. An overview of current environmental issues. Solutions to environmental problems are not always clear-cut; this course focuses on the controversies, debates, and clashing views.

ESCI 5201. Hydroclimatology. (3) Cross-listed Course(s):

ESCI 4201. Prerequisite(s): Graduate standing and Admission to M.S. in Earth Science program. Exploration of the climatic, meteorological, and geographic processes that determine water availability for human use and vegetation growth across Earth's ecosystems. Precipitation in tropical and extratropical weather systems; climate and land-surface factors that drive runoff, evaporation and photosynthesis; effects of long-term climate and CO₂ changes.

ESCI 5205. Climate Dynamics. (3) Prerequisite(s): Graduate

standing in Earth Science. Global climate, climate variability, and dynamics within the climate system, including large-scale phenomena such as El Niño and the North Atlantic Oscillation. Analysis of the links between large-scale climate phenomena and local weather. Three hours of combined lab and lecture per week.

ESCI 5210. Soil Science. (4) Prerequisite(s): GEOL 3124 and GEOL 3115, or permission of instructor. Study of soils, soil-forming processes and soil morphology with an emphasis on soils as they relate to geologic landscapes and surficial processes. Students will learn how to describe and interpret soils in the field. Three hours lecture, three hours lab per week with occasional field trips. Graduate students will fulfill the requirements of ESCI 4210. In addition, graduate students will be required to acquire laboratory and interpretive skills in soil chemical analyses and will have additional writing assignments for the course.

ESCI 5214. Global Ecosystems: Human Dimensions, and Environmental Dynamics. (3) Cross-listed Course(s): ESCI 4214. A multi-disciplinary course that surveys the history and prehistory of human ecological dynamics, drawing on geology, geography, and ecology to understand the interrelationships between global climates, global ecosystems, and their human inhabitants. Topics include: climatic change and its impacts on biological systems, peopling of new landscapes, anthropogenic vegetation change, extinctions, desertification, invasive species interactions, and changes in human subsistence.

ESCI 5220. Atmospheric Chemistry. (3) Prerequisite(s): CHEM 1251 and MATH 1242 with grades of C or above, or permission of instructor. Basic physical chemistry and a survey of major topics in atmospheric chemistry including fundamental properties of the atmosphere, tropospheric chemistry, air pollution, acid rain, stratospheric chemistry and the ozone hole, and the role of chemistry in the Earth's climate. Three hours of combined lecture and lab per week.

ESCI 5222. Watershed Science. (3) Prerequisite(s): ESCI 4140 or ESCI 5140, or permission of instructor. Examination of the cycling of water and chemical elements in natural and perturbed watersheds with emphasis on linkages between the hydrologic and biogeochemical processes which control runoff water quality. Topics include: runoff processes, evapotranspiration, nutrient export and stream, riparian and hyporheic zone hydrochemical dynamics.

ESCI 5240. Boundary-Layer Meteorology. (3) Prerequisite(s): Graduate standing in Earth Science. Examines the flow of temperature, moisture and wind within the atmosphere's boundary layer, including their interactions and exchanges with Earth's land and water surfaces. Applications to the diurnal cycle, short-term forecasting, and air pollution are also discussed. Three hours of lecture per week.

ESCI 5250. Advanced Dynamic Meteorology. (3) Prerequisite(s): METR 3250 with a grade of C or above, MATH 2171, and MATH 2241, or permission of instructor. In-depth examination of atmospheric dynamics, focusing on the structure and evolution of synoptic and mesoscale

weather systems, wave dynamics (Rossby, topographic, inertia-gravity, etc.), scale-analysis, nondimensional numbers, and atmospheric modeling. Three hours of combined lecture and lab per week.

ESCI 5251. Advanced Synoptic Meteorology. (3) Prerequisite(s): METR 3250 with a grade of C or above or permission of instructor. An integrated view of synoptic and dynamic meteorology focusing on advanced conceptual models and analysis techniques for mid-latitude weather systems and regional precipitation events. Three hours of combined lecture and lab per week.

ESCI 5320. Tropical Meteorology. (3) Prerequisite(s): METR 3250 or permission of instructor. A comprehensive study of the tropical atmosphere, including climatology, mean structure and circulation, air-sea energy exchange, cumulus transport, synoptic waves, and tropical storms. Special attention is paid to the formation, evolution, motion, and societal impacts of hurricanes. Three hours of combined lecture and lab per week.

ESCI 5350. Mesoscale Meteorology. (3) Pre- or Corequisite(s): METR 3250 or permission of instructor. A comprehensive study of the structure, evolution, and dynamics of atmospheric phenomena having spatial scales between 2 and 2000 km. Topics include: fronts, convective initiation, mesoscale convective systems, severe thunderstorms, tornadoes, low-level jets, drylines, land-sea breezes, shallow convection, and terrain effects. Three hours of combined lecture and lab per week.

ESCI 5400. Internship in Earth Sciences. (3 to 6) Prerequisite(s): Permission of the Graduate Committee. Research and/or work experience designed to be a logical extension of a student's academic program. The student must apply to Graduate Advisory Committee for an internship by submitting a proposal which specifies the type of work/research experience preferred and how the internship will complement his or her academic program. The Graduate Committee will attempt to place the selected students in cooperating community organizations to complete specified research or work-related tasks which are based on a contractual arrangement between the student and community organization. The student can receive three to six hours credit, depending on the nature and extent of the internship assignment.

ESCI 5800. Individual Study in Earth Sciences. (1 to 4) Prerequisite(s): Permission of instructor and credit hours established in advance. Tutorial study or special research problems. *May be repeated for credit with change of topic.*

ESCI 6000. Selected Topics in Earth Sciences. (1 to 4) Prerequisite(s): permission of the Earth Sciences Graduate Program Director. In-depth treatment of specific topics

selected from one of the concentrations in earth sciences (Solid Earth Sciences; Climatology and Hydrology; Environmental Systems Analysis). *May be repeated for credit with change of topic.*

ESCI 6105. Landscape Assessment. (4) Cross-listed Course(s): GEOG 8223. Prerequisite(s): GEOL 4105 or permission of instructor. An advanced geomorphology course that examines current climatic and/or tectonic geomorphology research topics and methods with a focus on regional or disciplinary issues that varies each offering. Using a variety of field-based quantitative and qualitative techniques such as laser surveys, GPS, trenching and/or coring, students devise and implement a research project that includes two related but separate field sites. Three hours seminar per week with three or four mandatory field trips.

ESCI 6120. Numerical Modeling of the Earth System. (3) Cross-listed Course(s): INES 8120. Focuses on fundamental principles and applications of numerical modeling in simulating components of the Earth system, including the atmosphere, land, and water. Philosophical considerations of why and how numerical models and model output are used in the Earth sciences are discussed. Also delves into the technical details of constructing a model, including finite differencing, boundary conditions, and parameterizations, and how these choices influence model output.

ESCI 6202. Earth Systems Analysis: Biogeochemical Cycles. (3) Cross-listed Course(s): GEOG 8224. Examines the Earth's water and major elemental cycles including those of carbon, nitrogen, sulfur, phosphorus and the major crustal elements. Uncertainties in the current state of understanding of global elemental cycles are examined. Special emphasis is placed on how these cycles are currently being modified through human activities.

ESCI 6130. Teaching and Learning in the Geosciences. (3) Cross-listed Course(s): GEOG 6130; GEOG 8130; INES 8130. Interactive, discussion-based course exploring effective pedagogy in the geosciences, applicable to many geoscience-related disciplines including atmospheric, ecological, oceanic, geologic, and geographic sciences. Students will explore what makes learning in the geosciences unique, teaching methods that enhance student learning, and how to create effective learning environments. Other topics include putting together lesson plans, assessing student work, and conducting pedagogical research.

ESCI 6222. Quaternary Paleoenvironmental Sciences. (3) Cross-listed Course(s): GEOG 6222, GEOG 8222, and INES 8222. A multi-disciplinary course which surveys methods used to reconstruct past climates, past environments, and past landscapes during the Quaternary period. Changes in

past environmental conditions are discussed in light of present and future landscape predictions emphasizing both natural and human causes. Focuses on biotic and abiotic material from terrestrial and marine sediment cores, ice cores, and other proxies for past environments and past climates.

ESCI 6226. Landscape Ecology. (3) Cross-listed Course(s): GEOG 6226, GEOG 8226, and INES 8226. An introduction to landscape ecology, the study of the interplay between spatial pattern and ecological process. Lectures and in-depth group discussions focus on the fundamental and applied aspects of topics such as habitat fragmentation, animal movement in human-dominated landscapes, landscape legacies, road ecology, and landscape planning.

ESCI 6227. Ecosystem Restoration. (3) Cross-listed Course(s): GEOG 6227, GEOG 8227, INES 8227. Ecosystem restoration has long been used as a method to return the natural structure and function to degraded ecosystems. This course examines the theory and methods used in restoration with a focus on both terrestrial and freshwater ecosystems. The science and policy of ecosystem restoration are also explored with examples from ecosystems around the world.

ESCI 6229. Geochemical Tracers and Hydrologic Applications. (3) Cross-listed Course(s): GEOG 6229, GEOG 8229, and INES 8229. Examines environmental tracers in surface and subsurface hydrology (streams, lakes, and groundwater) using an applied approach. Tracer techniques include geochemical element fingerprinting, stable isotopes, and residence time estimation.

ESCI 6250. Urban Air Quality. (3) Prerequisite(s): M.S. Earth Science, M.A. Geography, and Ph.D. INES and Public Policy students: METR 4150 and STAT 2221, or permission of instructor. Examination of the relationships between climatic processes and urban air quality with emphasis on trends and patterns. Topics will include health and environmental effects of air pollution, ozone climatology, pollutant transport, transportation related emissions, risk assessment, and air quality management.

ESCI 6600. Earth Sciences Graduate Seminar. (1) Prerequisite(s): Admission into the M.S. in Earth Sciences program. Discussion of holistic themes, discipline-specific issues, and current challenges in the Earth Sciences. Students actively participate in seminars delivered by student researchers, faculty, and invited speakers. Participation counts for a total of 2 credit hours (1 credit hour for each of two academic years). Prior to graduation, each student makes at least two seminar presentations and provides at least one formal critique of a presentation. *May be repeated for credit.*

ESCI 6800. Individual Study in Earth Sciences. (1 to 4)

Prerequisite(s): Permission of instructor and credit hours established in advance. Tutorial study or special research problems. *May be repeated for credit with change of topic.*

ESCI 6900. Earth Sciences Research. (1 to 9)

Prerequisite(s): permission of the student's research advisor. Students complete hypothesis or problem-driven research that includes formulation, implementation, analysis and presentation components. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

Engineering Technology (ETGR)

ETGR 5301. Environmental Pollution Control. (3)

Cross-listed Course(s): ETGR 4301. The major aspects of preventing and controlling air, water, and solid-waste pollution and disposal. Topics include: environmental standards and regulations, engineering controls, remediation techniques, sampling and monitoring, and environmental toxicology.

ETGR 5302. Industrial Hygiene. (3)

Cross-listed Course(s): ETGR 4302. Introduces the industrial hygienist's role in characterizing chemical, physical, and biological hazards in the workplace. Topics include: occupational standards and regulations, indoor air quality, ionizing and non-ionizing radiation, thermal stress, sampling/monitoring techniques, personal protective equipment, engineering controls, and program management.

ETGR 5303. Applied Ergonomics and Human Factors. (3)

Cross-listed Course(s): ETGR 4303. An overview of the physiological, biomechanical, and psychological concepts related to workplace layout, machine tools, and work methods. An emphasis is placed on the control and prevention of injuries from over-exertion and related musculoskeletal disorders.

ETGR 5305. System Safety Design and Management. (3)

Cross-listed Course(s): ETGR 4305. Prerequisite(s): Permission of department. Application of techniques and concepts of system safety methodologies and process safety management. Emphasis on the application of scientific, design and management principles incorporating safety audits, safety management, risk assessment, loss control, and statistical applications across all phases of a system life cycle.

ETGR 5272. Engineering Analysis IV. (3) A continuation of engineering analysis to include additional topics and applications in vector operations, probability, and statistics.

Finance (FINN)

FINN 5158. Student Managed Investment Fund I. (3)

Cross-listed Course(s): MBAD 5158. Prerequisite(s): FINN 3120 or MBAD 6152, FINN 3222 or FINN/MBAD 6153, and permission of instructor. Management of an actual portfolio consisting of a portion of the University's Endowment Fund. Students are required to take FINN 5159 following this course.

FINN 5159. Student Managed Investment Fund II. (3)

Cross-listed Course(s): MBAD 5159. Prerequisite(s): FINN 5158, FINN 3120 or MBAD 6152, FINN 3222 or FINN/MBAD 6153, and permission of instructor. Management of an actual portfolio consisting of a portion of the University's Endowment Fund.

FINN 5161. Financial Modeling. (3)

Prerequisite(s): Graduate standing and permission from the instructor. Cross-listed Course(s): FINN 4161. The objective of this course is to introduce spreadsheet techniques in the application of finance context and to help students get good preparation for a future career with Excel work. Students are learning to use Excel to accomplish financial analysis and let Excel do as much work as possible. The course covers topics in Corporate Finance and Investments. The course focuses on financial statement analysis, time value of money, security valuation, cost of capital, capital budgeting, efficient portfolios, CAPM, et al. The course covers Excel techniques including basic spreadsheet use, Excel built-in functions, Data tables, Scenario analysis, Solver, Data analysis, et al. The course requires a primary understanding of corporate finance and investments. It also needs some sophistication in statistics such as mean, standard deviation, covariance, correlation, et al.

FINN 5275. Enterprise Risk Management. (3)

Cross-listed Course(s): FINN 4275. Prerequisite(s): FINN 3271 or permission of department chair. An in-depth discussion of risk management in non-financial firms, including analysis of techniques that firms use to manage risks. Risk management strategies and how they are applied to business problems are discussed. Some of the techniques examined include self-insurance, captives, financial instruments, and retentions.

FINN 6058. Special Topics in Financial Services. (3)

Cross-listed Course(s): MBAD 6160. Prerequisite(s): MBAD 6152. Each year, the subject matter of this course deals with a different specialized and contemporary topic of interest to students who are preparing for management careers in the financial services industry. The topics are chosen and covered in a way that builds on and supplements the topics covered in other courses in the Financial Institutions/Commercial Banking concentration. Emphasis is placed on the managerial implications of the subject

matter as well as the impact on the financial system. *May be repeated for credit one time.*

FINN 6151. Financial Institutions and Markets. (3) Cross-listed Course(s): MBAD 6151. Major financial institutions, particularly commercial banks, and their role in the intermediation process and as suppliers of funds to the money and capital markets. Comparative financial policies of these institutions are examined in the context of their legal and market environment.

FINN 6152. Financial Management. (3) Cross-listed Course(s): MBAD 6152 and MSRE 6152. Theory and practice of corporate finance including asset management, cost of capital and capital budgeting, optimization problems and socio-economic aspects of financial management. Computer technology may be employed when applicable.

FINN 6153. Investment Management. (3) Cross-listed Course(s): MBAD 6153. Prerequisite(s): MBAD 6152. Theory and practice of investment decisions of individuals and fund managers. Topics include: the status of capital market theory, the efficient market hypothesis literature, and a portfolio performance measurement. Standard institutional and investment analysis topics, futures and options markets, and international investment topics are covered.

FINN 6154. Applied Business Finance. (3) Cross-listed Course(s): MBAD 6154. Prerequisite(s): MBAD 6152. Examination of business finance topics which typically confront the firm's primary finance functional areas (CFO, Treasurer, Controller). The purpose is to develop advanced analytical skills in those topic areas. Topics include: lease vs. buy (borrow); leveraged buy-outs; merger analysis (emphasis on valuation); international operations of American firms (capital budgeting and cost of capital); capital structure; risk management. Such additional topics as working capital management; risk management; and relevant current topics are included as time permits.

FINN 6155. Multinational Financial Management. (3) Cross-listed Course(s): MBAD 6155. Prerequisite(s): MBAD 6152. Financial management of the multinational firm including management of foreign exchange risk and political risk, and the control and evaluation of financial policies of multinational firms.

FINN 6156. Commercial Bank Management. (3) Cross-listed Course(s): MBAD 6156. Prerequisite(s): MBAD 6152. Techniques for the management of commercial banks. Topics include: industry structure, administrative organization, management of assets, liabilities, and capital, and financial analysis of the banking firm.

FINN 6157. Advanced Corporate Finance. (3) Cross-listed Course(s): MBAD 6157. Prerequisite(s): MBAD 6152.

Theories of modern corporate finance, including theory of efficient capital markets; uncertainty and the theory of choice; market equilibrium asset pricing models (capital asset pricing model, arbitrage pricing theory, Black-Scholes); theories of capital structure and the cost of capital; dividend policy; and leasing.

FINN 6203. Financial Economic Theory. (3) Cross-listed Course(s): ECON 6203. Prerequisite(s): Admission to the graduate program and permission of Program Director. The fundamental principles of risk pricing and risk allocation in a unified framework. Discrete-time model is employed to underscore the relationship between the techniques used in finance and the economic analysis of risk. The objective is to understand the economics of asset pricing and how derivatives and options are used in practice and their limitations.

FINN 6210. Financial Elements of Derivatives. (3) Corequisite(s): FINN 6203 or permission of department. Examines the nature and functions of futures and options markets. Topics include: hedging for risk reduction and the role of derivative instruments in the capital markets. Focuses on basic pricing techniques which are derived from no-arbitrage relations.

FINN 6211. Fixed Income Securities and Credit Risk. (3) Corequisite(s): FINN 6203 or permission of department. The fixed income securities and portfolios, as well as the theory and practice of fixed income markets. Topics include: fixed income instruments and sectors, duration and convexity, term structure of interest rates, securitization, portfolio management, hedging, and credit risk.

FINN 6212. Advanced Methods in Mathematical Finance. (3) Prerequisite(s): FINN 6210 or permission of department. Provides students with the opportunity for an in-depth study of advanced derivatives pricing methods. Topics include stochastic calculus, stochastic differential equations, option pricing using Fourier transforms, valuation of American options by simulation, Lévy process models of asset prices, stochastic volatility models, and dynamic hedging. Students also have an opportunity to learn to use the computer language Python in computational finance.

FINN 6213. Risk Management and Financial Institutions. (3) Prerequisite(s): FINN 6203 or permission of department. Topics include: How market risk, credit risk and operational risk are quantified; Basel II regulatory framework; estimation of aggregate economical capital; calculation and use of RAROC; and recent bank risk management tools: back test, CCAR and Dodd-Frank proposals. Also addresses recent big losses that have occurred in financial markets and how they can be avoided.

FINN 6214. Asset and Portfolio Management. (3)

Prerequisite(s): FINN 6203 or permission of department. Provides a foundation in investments and portfolio management from the perspective of an institutional investor. Particular attention is given to the issues associated with managing assets of an insurance company. Topics include: measuring and modeling return and risk, expected return models, information ratio, valuation theory and practice, forecasting, portfolio construction, transaction costs, turnover and trading, performance analysis, asset allocation, securities analysis, and the legal and regulatory landscape of institutional investing.

FINN 6215. Risk Management in Corporations. (3)

Prerequisite(s): FINN 6203 or permission of department. An in-depth discussion of enterprise risk management for all types of firms using the firm value maximization approach, including analysis of techniques that firms use to identify and manage risks. Risks are classified as hazard, operational, strategic, and financial risk. Risk management strategies and how they are applied to business problems in a dynamic business environment are discussed. Some of the strategies examined include insurance, self-insurance, captives, financial instruments, and retention.

FINN 6216. Quantitative Risk Management. (3)

Prerequisite(s): FINN 6203 or permission of department. The quantitative techniques and tools for the risk management, beginning with basic concepts and methodologies. Topics include: risk measures such as VaR and Expected Shortfall, univariate and multivariate models, copulas and tail dependence in risk management framework, and back testing. Also discusses how to estimate VaR and Expected Shortfall parametrically, semi parametrically and non-parametrically.

FINN 6217. Blockchain, Cryptocurrencies, and Decentralized Finance. (3)

Prerequisite(s): FINN 6210. Expertise in a programming language such as C++ or Python. Introduction to blockchain technologies with applications in finance. This technology enables fast and secure transactions without depending on a trusted party to intermediate. Students will study how cryptocurrencies are generated and how transactions take place on blockchains. Then students will study smart contract technology that controls the automated execution of electronic commitments among counterparties. Finally, students will survey various financial applications of this technology.

FINN 6219. Financial Econometrics. (3) Cross-listed Course(s): ECON 6219. Prerequisite(s): ECON 6218, ECON 6113, or STAT 6113. Advanced time series with financial applications. Topics include: time series regressions (univariate and multivariate, stationary and non-stationary) and time series models (including ARMA, ARCH, GARCH,

stochastic volatility and factor models). Emphasis placed on model properties, estimators, test statistics, and applications in finance.

FINN 6800. Directed Study in Finance. (1 to 3)

Prerequisite(s): Enrollment in M.S. in Mathematical Finance. Independent study of a theoretical and/or an empirical problem in a specific area of finance. Topics of the investigation may originate from the student or from the faculty member supervising the study. The student's work assignments are designed by the student and faculty member who oversees the project of study. The credit hours are determined prior to enrollment and are based on the particular project undertaken. *May be repeated for credit up to 6 credits and permission of the Graduate Program Director.*

Foreign Language Education (FLED)

FLED 5104. Assessment in the Teaching of K-12 Foreign Languages. (2) Cross-listed Course(s): FLED 4104.

Prerequisite(s): MDSK 5204 and MDSK 6162. Pre- or Corequisite(s): FLED 5200 and FLED 5105. Fosters Foreign Language Education teacher candidates' knowledge and skills of creating and implementing performance-based assessments in K-12 classrooms. Learning modules provide an overview of the major principles involved in foreign language assessment, focusing on both the theoretical and practical issues. Students practice creating, administering, and scoring assessments of interpretive, interpersonal, and presentational communication, as well as an Integrated Performance Assessment. They also practice analyzing data from such assessments, interpreting necessary changes in instruction based on those data, and providing student feedback.

FLED 5105. Applied Content Pedagogy. (1) Cross-listed Course(s): MDSK 4105. Prerequisite(s): MDSK 5204 and MDSK 6162. Corequisite(s): FLED 5200. Focuses on providing teacher education candidates exposure to the continued modeling of evidence-validated practices, the rehearsal of instructional tasks, and numerous opportunities for feedback on pedagogical decision-making within Foreign Language Education.

FLED 5200. Methods in Teaching Foreign Languages. (3) Cross-listed Course(s): FLED 4200. Prerequisite(s): MDSK 5204, MDSK 6162, admission to the Graduate Certificate in Teaching, and permission of department. Pre- or Corequisite(s): FLED 5105. Current trends and practices in teaching foreign languages in K-12 schools and addresses state-mandated competencies. The course is required for licensure in the teaching of K-12 Foreign Languages. Includes 25 hours of field experiences.

FLED 5201. K-8 Methods – Foreign Languages. (3)

Prerequisite(s): Admission to the Graduate Certificate in Teaching and permission of department. Current trends and practices in teaching foreign languages in the elementary school and the middle school (K-8), with emphasis on practical applications. Addresses state mandated competencies. Required for licensure in the teaching of French, German, or Spanish (K-12).

FLED 6200. Advanced Methods of Teaching Foreign Languages. (3)

Cross-listed Course(s): TESL 6276.
Prerequisite(s): Admission to the M.A.T. in Foreign Language Education and completion of Phase I of the program. A variety of topics will be addressed in order to prepare experienced second language teachers to be critical thinkers, second language researchers, and instructional and program leaders. Exemplar topics include the analysis of instructional methods and teaching strategies, curriculum design, research-based practices, multicultural education, and the mentoring and/or professional development of novice ESL teachers.

FLED 6470. Graduate Student Teaching and Internship – Foreign Language Education. (3 to 6)

Prerequisite(s): Completion of all education coursework required for the "A" license, background requirements, minimum score of Advanced-Low on the Oral Proficiency Interview (OPI), and an application for the course by the established deadline; and approval of the department. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting. Includes seminars. Participating students pay a course registration fee for edTPA portfolio assessment. *Graded on a Pass/Unsatisfactory basis.*

French (FREN)

FREN 5003. Studies in French Literature. (3) Prerequisite(s): Post-baccalaureate status, B.A. in French, or permission of department. Major topics in French literature. *May be repeated for credit with change of topic.*

FREN 5007. Studies in French Culture and Civilization. (3) Prerequisite(s): Post-baccalaureate status, B.A. in French, or permission of department. Major topics in French culture and civilization. *May be repeated for credit with change of topic.*

FREN 5050. Topics in French. (1 to 3) Prerequisite(s): Post-baccalaureate status; B.A. in French; ENGL 1102 or

equivalent, if taught in English. Major topics in French. May be taught in French or English. Will not count toward the major if taught in English. *May be repeated for credit with change of topic.*

FREN 5201. Survey of French Literature I. (3) Prerequisite(s): Post-baccalaureate status, B.A. in French, or permission of department. The major literary movements from the Middle Ages to the Enlightenment, with sample texts. Emphasis on continuity and change.

FREN 5202. Survey of French Literature II. (3) Prerequisite(s): Post-baccalaureate status, B.A. in French, or permission of department. The major literary movements from the Enlightenment to the contemporary period, with sample texts. Emphasis on continuity and change.

FREN 5410. Professional Internship in French. (1 to 6)

Prerequisite(s): Post-baccalaureate status, B.A. in French, or permission of department. Faculty-supervised field and/or research experience in a cooperating profession (e.g., business) or community organization. Contents of internship based upon a contractual agreement among the student, department, and business or community organization. *Graded on a Pass/Unsatisfactory basis.*

FREN 5800. Directed Individual Study. (1 to 3)

Prerequisite(s): Post-baccalaureate status, B.A. in French, or permission of department. Individual work on a selected area of study. To be arranged with the instructor, generally during the preceding semester, and by special permission only. *May be repeated for credit.*

Geography (GEOG)

GEOG 5000. Topics in Geography. (3) Major topics in Geography. *May be repeated for credit with change of topic.*

GEOG 5102. Cartographic Design and Map Construction. (3) Design process and basic map construction techniques with particular emphasis on the graphic elements of map design, planning map design, creating visual hierarchies, the uses of color, and basic mechanical color separation.

GEOG 5103. Computer Programming for GIS Applications. (3) Cross-listed Course(s): GEOG 4103. Prerequisite(s): GEOG 6125. Automated methods of gathering, storing, manipulating and displaying spatial data. Emphasis on the use of existing software and the design and implementation of geographic data structures and algorithms.

GEOG 5108. Sport, Place, and Development. (3)

Prerequisite(s): GEOG 1105. Examines sport and its impact on the landscape of cities and communities. Implications of

sport are examined in terms of urban use, urban social structure, markets, franchise movement and expansion, urban politics, its role in defining sense of place, and its impact on the development of communities and regions.

GEOG 5110. GIS for Nonmajors. (3) Examines the fundamental concepts and techniques of Geographic Information System (GIS) technology and its application to social and physical sciences. Students learn processing, collecting, organizing, displaying, and analyzing geographic data from address geocoding, GPS, CD-ROM, World Wide Web, and other sources. Emphasis placed on data preparation, analysis, and presentation. Labs introduce students to ArcGIS.

GEOG 5120. Introduction to Geographic Information Systems. (4) Prerequisite(s): Permission of instructor. Development, current state-of-the-art and future trends in geographic information processing with emphasis on data gathering, storage, and retrieval, analytical capabilities and display technologies. A laboratory component will include development and completion of an applied GIS research project. Additional requirements for graduate credit. Three lecture hours, one two-hour lab per week.

GEOG 5131. Environmental Modeling with GIS. (4) Prerequisite(s): GEOG 5120 or permission of instructor. Theories and practices of modeling the environment with GIS. Topics include: types of spatial modeling frameworks; GIS data sources and measurement technologies for environmental modeling; development, calibration, and validation of environmental models; 3-dimensional modeling and visualization of physical processes; and spatial analysis of human-environment interactions.

GEOG 5132. Spatial Modeling for Social and Economical Applications. (3) Theories and practices of spatial modeling with social and economical applications. Topics include: overview of modeling in human geography, socioeconomic data sources, and building and evaluating spatial models. Examples of models covered in class include: spatial accessibility, interaction, diffusion, tipping points, segregation (simulation), geodemographic/segmentation, and Markov models (stochastic).

GEOG 5150. Spatial Database Development with GPS and GIS. (3) The fundamentals of database management systems and their relevance in GIS. Emphasis placed on the effective creation, maintenance, and retrieval of data from a spatially enabled database. Topics include: relational database theory and design, entity-relationship diagrams, Structured Query Language (SQL), spatial queries, geodatabase design.

GEOG 5155. Retail Location. (3) Spatial attributes of retailing and related activities. Location patterns, store location

research, trade area delineation and consumer spatial behavior.

GEOG 5160. The Geography of Transportation Systems. (3) Geographical and human factors that affect the movement of goods and people from place to place. Emphasis on transportation routes and networks, commodity flow patterns and the locational implications of freight rates.

GEOG 5180. Web GIS. (3) Cross-listed Course(s): GEOG 4180. Prerequisite(s): GEOG 6125. Introduction to the basic knowledge of, and advance in, Internet/Web GIS. It covers principles, methods, and applications of Web- or Internet-based GIS. Through hands-on laboratory exercises, students develop the skill necessary to use Web GIS software packages for conducting GIS data operations (including query and mapping) and spatial analysis/modeling via Internet.

GEOG 5200. Environmental Justice, Injustice, and Planning. (3) Prerequisite(s): Graduate standing in Geography. Cross-listed course(s): GEOG 4200. Introduces students to the history of the environmental justice movement, exploring the environmental issues, policies, and government and community responses to addressing environmental injustice. Students will learn about environmental justice through empirical studies on the spatial distribution of environmental quality and health, enforcement of regulations, access to resources to respond to urban and industrial problems, and environmental decision-making processes through the lens of race and class. Course readings, videos, and lectures will analyze how communities of color, rural, and/or low-income communities, and undocumented immigrants improve environmental regulations and policies through their resistance and activism, despite their exclusion from environmental planning and decision-making processes. Lastly, students will be introduced to community and government led strategies to promote environmentally just development.

GEOG 5209. Small Town Planning. (3) Explores small town population dynamics, rural-urban fringe land use dynamics, and changes in small towns' community identity and sense of place. Emphasis placed on the issues and techniques that typify small town planning environments. Students investigate these issues via field work and data collection at municipal scales within the Charlotte region.

GEOG 5210. Urban Planning Methods. (3) Scope and methods of urban planning. Emphasis on analytical techniques, projections, and data sources used in developing comprehensive planning tasks and strategies.

GEOG 5215. Urban Ecology. (3) An introduction to the emerging field of urban ecology. Explores the biological,

physical, and social components of the urban ecosystem at local, regional, and global scales. Emphasis on the interplay among components and the sustainability of cities during lectures, field trips, and group discussions.

GEOG 5240. Geography of Knowledge and Information.

(3) Examination of the factors that influence the location of economic activities in the information age. Discussions and lectures explore the geographic aspects of the transition away from manufacturing to information processing as the primary mode of production. The transition is examined in terms of technology development, urban and regional development, information flows, and the location of quaternary industry.

GEOG 5250. Food, Migration, and Place. (3) Cross-listed Course(s): GEOG 4250. As people move in the world, food plays a central role in shaping identity, reproducing myth and ritual, and connecting diasporic communities. This mobility establishes dynamic foodways and gives rise to new food landscapes through which we can understand temporally connected sites of intense interaction. This course unpacks these processes through investigating the dynamics of food production and consumption in a transnational world. Recognizing the centrality of culinary culture in migrant identities, this course focuses on the role of food habits, rituals, and practices in producing and sustaining shared identities and places. Students gain an understanding of these relations through engagement with case studies and literature addressing the complex spaces we inhabit in a transnational world.

GEOG 5255. Applied Population Analysis. (3) Population data sources; measuring population change; elementary projection and estimation techniques; spatial sampling; migration; survey design; applications in the public and private sectors.

GEOG 5265. Transportation Analysis Methods. (3) Prerequisite(s): Permission of department; statistics recommended. Procedures for analyzing the operation and performance of transportation systems; includes network planning models, minimum path algorithms and assignments; energy, air pollution, and activity analysis models; and research approaches, data sources, time and activity budgets, infrastructure condition and needs assessment.

GEOG 5300. Black Place-Making: Introduction to Black Geographies. (3) Black Geographies is a discipline within the critical geographies canon that studies the social, political, cultural, economic, and ecological aspects of race in/and geography. The course encourages critical reflection on the issues, processes, intrinsic qualities, and interconnections that shape Black lives and geographies on local, national, continental, and international scales. This

course introduces students to the rich body of literature and activism highlighting the characteristics, politics, and practices that shape and are shaped by Black communities, and their connections to place, self and the environment.

GEOG 5305. Urban Field and Research Methods. (3)

Prerequisite(s): six hours of urban-related undergraduate courses or permission of instructor. Intensive field study of cities of the Carolinas, with specific emphasis on the Charlotte metropolitan area.

GEOG 5310. Urban Social Geography. (3) Prerequisite(s): GEOG 1105 and at least one of GEOG 2200, GEOG 2165, GEOG 3100, or GEOG 3205, or permission of instructor. Examines the reflexive relationship between society and urban space. Explores the intersection between urban geography and social theory, the evolution of city, community and personal spaces, and the relations and constructions of class, race, gender, and sexuality that shape and are shaped by the urban spaces in which we live and work.

GEOG 5315. The Urban Form. (3) Prerequisite(s): Geography Graduate Standing. Cross-listed course(s): GEOG 4315. In this course, students will become familiar with the elements that structure urban form as well as the actors, principles, institutions, and other forces that shape the processes of urbanization. We will approach city building as an iterative process that unfolds at a range of scales, analyzing the ways in which urban form has been shaped by natural settings, agricultural production, land subdivision practices, building forms, transportation networks, land use patterns, social norms, and planning theories. Examples and case studies will be drawn from cities worldwide, while student assignments and projects will focus on the city of Charlotte.

GEOG 5340. Urban Analytics. (3) Prerequisite(s): Must be enrolled as a graduate student in an MA or MS program. Cross-listed Course(s): GEOG 4340. Urban analytics is an emerging field that helps improve the understanding, management, and planning of cities by harnessing urban big data from a wide array of sources, including mobile devices, remote sensing, social media, and government records. This course is designed to introduce students to the basics of data analytics and its application in dealing with various urban challenges, such as urban sprawl, crime, air pollution, socioeconomic inequity, sustainable transportation, and public health. Hands-on practices will help students to be equipped with the knowledge and skills to collect, manage, and analyze data in urban environments to extract meaningful insights and make informed decisions that support urban planning and policymaking.

GEOG 6000. Topics in Urban and Regional Analysis. (3) Cross-listed Course(s): GEOG 8000. Examination of major theories, methods, and issues in the area of urban and regional analysis. Instructional method(s) vary according to topic, course objectives, and instructor. *May be repeated for credit with change of topic.*

GEOG 6005. Topics in Earth and Environmental Systems. (3) Cross-listed Course(s): GEOG 8005. Emerging methods and research frontiers in Earth and Environmental Systems. Course format includes lectures, student-led group discussions of readings, and/or hands-on data collection and analysis in the field or using available datasets. *May be repeated for credit with change of topic.*

GEOG 6010. Topics in Geographic Information Science. (3) Cross-listed Course(s): GEOG 8010. Examination of major theories, methods, and issues in the area of Geographic Information Science. Instructional method(s) vary according to topic, course objectives, and instructor. *May be repeated for credit with change of topic.*

GEOG 6030. Topics in Geographic Techniques. (3) Cross-listed Course(s): GEOG 8030. Cartographic, remote sensing, quantitative techniques or field techniques. *May be repeated for credit with change of topic.*

GEOG 6115. Qualitative Methods in Geography. (3) Cross-listed Course(s): GEOG 8115. Prerequisite(s): GRAD 6101 or equivalent. An overview of qualitative research methods commonly used in the geosciences. In addition to reviewing the evolution and theoretical underpinnings of qualitative approaches in the field of Geography generally, the course explores the application and evaluation of various methodologies such as, but not limited to, interviews, focus groups, discourse analysis and participatory research. Issues of research design, rigor, ethics, and communication of qualitative methods are also addressed.

GEOG 6120. Spatial Statistics. (3) Cross-listed Course(s): GEOG 8120, GRAD 6104, GRAD 8104, and INES 8090. Introduction to modern spatial statistics methods and their applications for the analysis of spatial data. Fundamental characteristics of spatial data, including spatial dependence, stationarity, and isotropy are covered. Three main categories of spatial statistics are given focus: spatial point pattern analysis, spatial prediction and geostatistics, and spatial regression. Hands-on practices are given to facilitate the understanding of theories and methods of spatial statistics.

GEOG 6121. Advanced Seminar on Spatial Modeling. (3) Cross-listed Course(s): GEOG 8121. Prerequisite(s): GEOG 5131, GEOG 5132, or permission of instructor. This seminar focuses on the theories of spatial modeling and simulation. Topics include, but are not limited to, spatial systems,

models for spatial analysis, models for spatial simulation, modeling life-cycle, model verification, validation, and accreditation.

GEOG 6123. The Urban Region. (3) Cross-listed Course(s): GEOG 8123 and PPOL 8610. Examination of the nature of urban regions and the basic factors that shape urban regions as they grow. Impact of: geography; history; social factors; economic factors; concerns about gender, race and ethnicity, and class; and other determinants of the nature of urban regions, their problems, and possible policy solutions.

GEOG 6124. Seminar in Geographic Theory and Practice. (3) Cross-listed Course(s): GEOG 8124. Prerequisite(s): Permission of instructor. Critical examination of trends in the history and philosophy of geographic thought and their application across the human, physical, and methodological domains of the discipline.

GEOG 6125. Geographic Information Science and Technology. (4) Cross-listed Course(s): GEOG 8125. Development, current state-of-the-art and future trends in geographic information science and technology. Topics include: Nature of spatial data, scale, representation, projection, topological relationships, data acquisition (geocoding, GPS, Volunteered Geographic Information), data uncertainty, data organization (spatial database), spatial data manipulation and protection (geomasking, aggregation), overlay operations (including spatial join), network analysis, raster and terrain modeling, spatial autocorrelation (global and local), spatial interpolation, spatial and space-time clustering. Concepts of cartographic design are introduced throughout the class. Several applications and laboratory exercises illustrate the concepts set forth in the class.

GEOG 6130. Teaching and Learning in the Geosciences. (3) Cross-listed Course(s): ESCI 6130; GEOG 8130; INES 8130. Interactive, discussion-based course exploring effective pedagogy in the geosciences, applicable to many geoscience-related disciplines including atmospheric, ecological, oceanic, geologic, and geographic sciences. Students will explore what makes learning in the geosciences unique, teaching methods that enhance student learning, and how to create effective learning environments. Other topics include putting together lesson plans, assessing student work, and conducting pedagogical research.

GEOG 6131. Research Design Fundamentals. (3) Cross-listed Course(s): GEOG 8131. Prerequisite(s): GRAD 6101 or equivalent; and permission of instructor. Scientific research and problem-solving. Problem identification, bibliographic search, data sources, collection and management, techniques selection and preparation of reports, proposals, peer review, and publication. Topics also include: human

subjects and societal impacts of research, conflict of interest, collaboration, mentorship, and research misconduct.

GEOG 6205. Geovisualization. (3) Cross-listed Course(s): GEOG 8205. Prerequisite(s): GEOG 6125. Cartographic design, representation versus communication, cognitive and perceptual issues, visual variables and color, proportional symbology, choropleth and flow mapping. Exploratory space-time data analysis. Representation of change (space-time) and movement. Interactive, dynamic and animated visualization. 3D geovisualization. Series of exercises in a GIS environment.

GEOG 6208. GIS&T and Urban Regional Analysis. (3) Cross-listed Course(s): GEOG 8208. Prerequisite(s): Permission of instructor. Focuses on the spatial thinking, spatial analytic methods and their GIS applications suited for urban and regional analyses. Modeling approaches include spatial interaction models, spatial optimization methods, spatial diffusion, space-time modeling of individual behavior and integrated transportation land-use models.

GEOG 6209. Social Network Analysis. (3) Cross-listed Course(s): GEOG 8209. Prerequisite(s): GRAD 6101 or equivalent. Pre- or Corequisite(s): GRAD 6101. Focuses on the use of social network analysis to understand the expanding connectivity and complexity of the socioeconomic world at all scales, and to systemically study semantic relationships and emerging social structures, whether they are social organizations, companies, virtual or place-based communities, markets, or politically-defined entities. Discusses how social network concepts, theories, and methods frame a wide range of phenomena within the context of relevant social science theories. Emphasis is placed on applied methods and on developing skills useful in empirical social science research.

GEOG 6210. The Restructuring City. (3) Cross-listed Course(s): GEOG 8210 and PPOL 8615. Critical assessment of the causes and consequences of contemporary urban restructuring. Evaluation of theoretical, planning and policy challenges facing urban society associated with global-local change.

GEOG 6211. Cities and Immigrants. (3) Cross-listed Course(s): GEOG 8211. Prerequisite(s): Permission of instructor. Examination of changing patterns and dynamics of immigrant settlement and adjustment in U.S. and Canadian urban areas. Topics include: assimilation and integration, identity formation, trans-nationalism, enclave development, labor market involvement, gateway versus new destinations, immigrant suburbanization, and socio-spatial isolation.

GEOG 6212. Urban Labor Markets. (3) Cross-listed Course(s): GEOG 8212. Prerequisite(s): Permission of instructor. Explores the changing social and spatial structure of urban labor markets in post-industrialized cities. Special reference to immigrant and minority labor markets in the U.S. Topics include: discrimination, industry and occupation concentrations, job queues, ethnic networks, ethnic entrepreneurs, technological change and economic restructuring.

GEOG 6214. Resilience Thinking in Urban/Regional Socio-Ecological Systems. (3) Cross-listed Course(s): GEOG 8214. Examines critically the art and science of resilience thinking within the context of urban and regional socio-ecological systems (i.e., urban resilience) and explores resilience building as both an instrument for, and practice of, urban sustainable development.

GEOG 6215. Urban Identities: Explorations of Power, Inequality, and Identity in Contemporary Cities. (3) Cross-listed Course(s): GEOG 8215. Contemporary cities are idealized as cosmopolitan places inhabited by residents of different genders, ethnicities, sexualities, classes, and other identities. Yet each of these intersecting axes of difference contribute to varied experiences, struggles, and uses of urban space. This course examines the production and maintenance of relations of power, inequality, and identity in contemporary cities. Critical frameworks in feminist, critical race, sexuality, post-colonial, and intersectional theory are used to consider the ways that intersecting power relations are spatialized and embodied, shape perceptions and understanding of space and place, and contribute to struggles for the right to the city. Such frameworks are applied to urban processes and problems relating to economic restructuring, housing, poverty, public space, and social movements.

GEOG 6216. Planning for Urban Sustainability. (3) Cross-listed Course(s): GEOG 8216. Engages students in reading, discussion, and guided research on the dilemmas of urban sustainability and planning approaches to address these dilemmas. Examines the concept of sustainability critically, comparing its diverse applications and meanings as a guide for decisions in the built environment. Explores the social and physical structures that make radical change difficult, as well as innovations in city planning like ecological footprinting, climate action planning, smart growth, bus rapid transit, energy-efficient technologies, the sharing economy, and grassroots movements for alternative communities like ecovillages. Although the course engages scholarship from all over the world, and explores innovations in Latin American and some European cities, most of the discussion focuses on problems and solutions specific to the United States.

GEOG 6220. Human-Environment Interactions. (3) Cross-listed Course(s): GEOG 8220. Prerequisite(s): Permission of

instructor. Investigates the inter-relationships between humans and their natural or physical environments. Topics include: human subsistence strategies, natural resource use, and human impact upon vegetation, soil, water, landforms, and climate.

GEOG 6221. Global Ecosystems. (3) Cross-listed Course(s): GEOG 8221. A multi-disciplinary course which surveys the history and prehistory of human ecological dynamics, drawing on geology, geography, and ecology to understand the interrelationships between global environmental systems and their inhabitants. Topics include: climatic change and its impacts on biological systems, peopling of new landscapes, anthropogenic vegetation change, extinctions, desertification, invasive species interactions, and changes in human subsistence.

GEOG 6222. Quaternary Paleoenvironmental Sciences. (3) Cross-listed Course(s): ESCI 6222, GEOG 8222, and INES 8222. A multi-disciplinary course which surveys methods used to reconstruct past climates, past environments and past landscapes during the Quaternary period. Changes in past environmental conditions are discussed in light of present and future landscape predictions emphasizing both natural and human causes. Focuses on biotic and abiotic material from terrestrial and marine sediment cores, ice cores, and other proxies for past environments and past climates.

GEOG 6225. Biogeography. (3) Cross-listed Course(s): GEOG 8225. Prerequisite(s): Permission of instructor. Introduction to the field of biogeography, the study of the distribution of organisms across space and time. Foundational theories and principles in biogeography, as well as emerging research frontiers, are covered in lectures and student-led group discussions of weekly readings.

GEOG 6226. Landscape Ecology. (3) Cross-listed Course(s): ESCI 6226, GEOG 8226, and INES 8226. An introduction to landscape ecology, the study of the interplay between spatial pattern and ecological process. Lectures and in-depth group discussions focus on the fundamental and applied aspects of topics such as habitat fragmentation, animal movement in human-dominated landscapes, landscape legacies, road ecology, and landscape planning.

GEOG 6227. Ecosystem Restoration. (3) Cross-listed Course(s): ESCI 6227, GEOG 8227, and INES 8227. Ecosystem restoration has long been used as a method to return the natural structure and function to degraded ecosystems. This course examines the theory and methods used in restoration with a focus on both terrestrial and freshwater ecosystems. Focuses on the science and policy of ecosystem restoration with examples from ecosystems around the world.

GEOG 6229. Geochemical Tracers and Hydrologic Applications. (3) Cross-listed Course(s): ESCI 6229, GEOG 8229, and INES 8229. Examines environmental tracers in surface and subsurface hydrology (streams, lakes, and groundwater) using an applied approach. Tracer techniques include geochemical element fingerprinting, stable isotopes, and residence time estimation.

GEOG 6282. CyberGIS and Big Data. (3) Cross-listed Course(s): GEOG 8282. Prerequisite(s): GEOG 6125. CyberGIS and Big Data represent two emerging themes in the study of geographic information science. As geospatial technologies advance, big spatial data are increasingly available. However, the processing and analytics of these big spatial data represent a challenge. Cyberinfrastructure-enabled GIS (i.e., CyberGIS) provides solid support for resolving this challenge. The significance of CyberGIS in handling big spatial data analytics has been well recognized. This course focuses on the key capabilities of CyberGIS: high-performance and parallel spatial computing, spatial cloud computing, and big data analytics. It also exposes students to cutting-edge cyberinfrastructure theories, methods, and geospatial applications. Students benefit from this course by learning how to leverage state-of-the-art cyberinfrastructure-enabled GIS technologies for the resolution of complex spatiotemporal problems. With training from cyber-enabled GIS and big data, students are very productive in their specific domains and competitive in their future career.

GEOG 6300. Applied Regional Analysis. (3) Cross-listed Course(s): GEOG 8300. Prerequisite(s): Basic computer skills including spreadsheets. Introduction to methods and techniques used in regional analysis. Topical areas include data sources and collection, regional delineation, community and regional profiles, regional accounts, methods of analysis and impact assessment. Topics are discussed in terms of theory, use, and role in economic geography and regional development. Emphasis is placed on application of economic and demographic methods at the regional level.

GEOG 6302. Regional Economic Development. (3) Cross-listed Course(s): GEOG 8302 and PPOL 8642. Neo-classical and contemporary theories of trade, economic geography and urban and regional development. Topics include: theories of urban and regional growth, location theories including industry, central places, and growth centers; human capital, labor force, and entrepreneurial contributions to growth; policy dimensions of urban growth and development are addressed from theoretical and empirical perspectives.

GEOG 6304. The Transforming North Carolina Economy. (3) Cross-listed Course(s): GEOG 8304. Prerequisite(s): Permission of instructor. An examination of the

contemporary and historic forces which shape the economic geography of the state. Themes examined will include human-land interactions, past and present economic transitions and the rural-urban balance within the state. Emphasis will be placed on understanding the economic forces which will most dramatically impact the future. Seminar format.

GEOG 6305. Site Feasibility Analysis. (3) Cross-listed Course(s): MBAD 6258 and MSRE 6258. Prerequisite(s): Permission of instructor. Examination of factors affecting the feasibility of land parcels for commercial and residential development with emphasis on the physical evaluation of a given site, the market support for its intended use, and the financial support for the proposed development.

GEOG 6306. Store Location Research. (3) Prerequisite(s): GRAD 6101 or permission of instructor. Market area analysis and site evaluation methods, including the application of multivariate statistical models, spatial interaction-gravity models, and location-allocation techniques to the retail location analysis task.

GEOG 6408. Spatial Optimization. (3) Cross-listed Course(s): GEOG 8408. Prerequisite(s): GEOG 5120 or permission of instructor. Spatial Optimization is articulated around the explicit use of GIS tools and techniques to solve coverage, distance-decay problems as well as routing problems integrating geographic information. Case studies in various domains such as urban retailing or transportation. Problem formulation and solution techniques to optimally preserve existing natural reserves, such as reservoir resources or locating natural corridors between biologically rich areas to protect diversity.

GEOG 6500. Urban Planning: Theory and Practice. (3) Cross-listed Course(s): GEOG 8500 and PPOL 8616. Critical assessment of alternative planning theories and their application to planning practices. Examination of economic, political, social, cultural and geographical factors affecting the operations of cities and resource distribution.

GEOG 6501. Community Planning Workshop. (3) Cross-listed Course(s): ARCH 6050 and MUDD 5601. Problem-solving, client-based course designed to give students experience in applying planning theory and methods to actual problems. Types of problems include growth management, land use planning, regional planning, community development, urban design, infrastructure financing, economic development, and environmental management. Students will gain experience compiling and analyzing community scale data, working with citizens, professional planners, and elected officials and preparing oral reports and technical documents. The workshop

setting will build upon and extend conventional classroom instructions.

GEOG 6600. Transportation Policy. (3) Cross-listed Course(s): GEOG 8600 and PPOL 8613. Examination of surface transportation from a public policy perspective. Institutional components and role of government at all levels influencing investment; changes in technology, environment, security, safety, equity, cost-effectiveness, public health and welfare are covered.

GEOG 6800. Directed Problems in Geography. (1 to 4) Cross-listed Course(s): GEOG 8800. Individual research into geographic topics. *May be repeated for credit one time with change of topic.*

GEOG 7900. Individual Research Project. (1 to 6) Individual research report based on directed study of a topic of geographic significance. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit (required minimum total of 6 credits).*

GEOG 8000. Topics in Urban and Regional Analysis. (3) Cross-listed Course(s): GEOG 6000. Examination of major theories, methods, and issues in the area of urban and regional analysis. Instructional method(s) vary according to topic, course objectives, and instructor. *May be repeated for credit with change of topic.*

GEOG 8005. Topics in Earth and Environmental Systems. (3 to 4) Cross-listed Course(s): GEOG 6005. Emerging methods and research frontiers in Earth and Environmental Systems. Course format includes lectures, student-led group discussions of readings, and/or hands-on data collection and analysis in the field or using available datasets. *May be repeated for credit with change of topic.*

GEOG 8010. Topics in Geographic Information Science. (3) Cross-listed Course(s): GEOG 6010. Examination of major theories, methods and issues in the area of Geographic Information Science. Instructional method(s) vary according to topic, course objectives and instructor. *May be repeated for credit with change of topic.*

GEOG 8030. Topics in Geographic Techniques. (3) Cross-listed Course(s): GEOG 6030. Cartographic, remote sensing, quantitative techniques or field techniques. *May be repeated for credit with change of topic.*

GEOG 8115. Qualitative Methods in Geography. (3) Cross-listed Course(s): GEOG 6115. Prerequisite(s): GRAD 8101 or equivalent, or permission of instructor. An overview of qualitative research methods commonly used in the geosciences. In addition to reviewing the evolution and theoretical underpinnings of qualitative approaches in the field of Geography generally, the course explores the application and evaluation of various methodologies such

as, but not limited to, interviews, focus groups, discourse analysis and participatory research. Issues of research design, rigor, ethics, and communication of qualitative methods are also addressed.

GEOG 8120. Spatial Statistics. (3) Cross-listed Course(s): GEOG 6120, GRAD 6104, GRAD 8104, and INES 8090. Prerequisite(s): GRAD 8101 or equivalent. Introduction to modern spatial statistics methods and their applications for the analysis of spatial data. Fundamental characteristics of spatial data, including spatial dependence, stationarity, and isotropy are covered. Three main categories of spatial statistics are given focus: spatial point pattern analysis, spatial prediction and geostatistics, and spatial regression. Hands-on practices are given to facilitate the understanding of theories and methods of spatial statistics.

GEOG 8121. Advanced Seminar on Spatial Modeling. (3) Cross-listed Course(s): GEOG 6121. Prerequisite(s): GEOG 5131, GEOG 5132, or permission of instructor. This seminar focuses on the theories of spatial modeling and simulation. Topics include, but are not limited to, spatial systems, models for spatial analysis, models for spatial simulation, modeling life-cycle, model verification, validation, and accreditation.

GEOG 8123. The Urban Region. (3) Cross-listed Course(s): GEOG 6123 and PPOL 8610. Examination of the nature of urban regions and the basic factors that shape urban regions as they grow. Impact of: geography; history; social factors; economic factors; concerns about gender, race and ethnicity, and class; and other determinants of the nature of urban regions, their problems, and possible policy solutions.

GEOG 8124. Seminar in Geographic Theory and Practice. (3) Cross-listed Course(s): GEOG 6124. Prerequisite(s): Permission of instructor. Critical examination of trends in the history and philosophy of geographic thought and their application across the human, physical, and methodological domains of the discipline.

GEOG 8125. Geographic Information Science and Technology. (4) Cross-listed Course(s): GEOG 6125. Development, current state-of-the-art and future trends in geographic information science and technology. Topics include: Nature of spatial data, scale, representation, projection, topological relationships, data acquisition (geocoding, GPS, Volunteered Geographic Information), data uncertainty, data organization (spatial database), spatial data manipulation and protection (geomasking, aggregation), overlay operations (including spatial join), network analysis, raster and terrain modeling, spatial autocorrelation (global and local), spatial interpolation, spatial and space-time clustering. Concepts of cartographic design are introduced throughout the class.

Several applications and laboratory exercises illustrate the concepts set forth in the class.

GEOG 8130. Teaching and Learning in the Geosciences. (3) Cross-listed Course(s): ESCI 6130, GEOG 6130, INES 8130. Interactive, discussion-based course exploring effective pedagogy in the geosciences, applicable to many geoscience-related disciplines including atmospheric, ecological, oceanic, geologic, and geographic sciences. Students will explore what makes learning in the geosciences unique, teaching methods that enhance student learning, and how to create effective learning environments. Other topics include putting together lesson plans, assessing student work, and conducting pedagogical research.

GEOG 8131. Research Design Fundamentals. (3) Cross-listed Course(s): GEOG 6131. Prerequisite(s): GRAD 8101 or equivalent; and permission of instructor. Scientific research and problem-solving. Problem identification, bibliographic search, data sources, collection and management, techniques selection and preparation of reports, proposals, peer review, and publication. Topics also include: human subjects and societal impacts of research, conflict of interest, collaboration, mentorship, and research misconduct.

GEOG 8205. Geovisualization. (3) Cross-listed Course(s): GEOG 6205. Prerequisite(s): GEOG 8125. Cartographic design, representation versus communication, cognitive and perceptual issues, visual variables and color, proportional symbology, choropleth and flow mapping. Exploratory space-time data analysis. Representation of change (space-time) and movement. Interactive, dynamic and animated visualization. 3D geovisualization. Series of exercises in a GIS environment.

GEOG 8208. GIS&T and Urban Regional Analysis. (3) Cross-listed Course(s): GEOG 6208. Prerequisite(s): Permission of instructor. Focuses on the spatial thinking, spatial analytic methods and their GIS applications suited for urban and regional analyses. Modeling approaches include spatial interaction models, spatial optimization methods, spatial diffusion, space-time modeling of individual behavior and integrated transportation land-use models.

GEOG 8209. Social Network Analysis. (3) Cross-listed Course(s): GEOG 6209. Prerequisite(s): GRAD 6101 or equivalent. Pre- or Corequisite(s): GRAD 6101. Focuses on the use of social network analysis to understand the expanding connectivity and complexity of the socioeconomic world at all scales, and to systemically study semantic relationships and emerging social structures, whether they are social organizations, companies, virtual or place-based communities, markets, or politically-defined entities. Discusses how social

network concepts, theories, and methods frame a wide range of phenomena within the context of relevance.

GEOG 8210. The Restructuring City. (3) Cross-listed Course(s): GEOG 6210 and PPOL 8615. Critical assessment of the causes and consequences of contemporary urban restructuring. Evaluation of theoretical, planning and policy challenges facing urban society associated with global-local change.

GEOG 8211. Cities and Immigrants. (3) Cross-listed Course(s): GEOG 6211. Prerequisite(s): Permission of instructor. Examination of changing patterns and dynamics of immigrant settlement and adjustment in U.S. and Canadian urban areas. Topical areas include assimilation and integration, identity formation, trans-nationalism, enclave development, labor market involvement, gateway versus new destinations, immigrant suburbanization and socio-spatial isolation.

GEOG 8212. Urban Labor Markets. (3) Cross-listed Course(s): GEOG 6212. Prerequisite(s): Permission of instructor. Explores the changing social and spatial structure of urban labor markets in post-industrialized cities. Special reference to immigrant and minority labor markets in the U.S. Topics include: discrimination, industry and occupation concentrations, job queues, ethnic networks, ethnic entrepreneurs, technological change and economic restructuring.

GEOG 8214. Resilience Thinking in Urban/Regional Socio-Ecological Systems. (3) Cross-listed Course(s): GEOG 6214. Examines critically the art and science of resilience thinking within the context of urban and regional socio-ecological systems (i.e., urban resilience) and explores resilience building as both an instrument for, and practice of, urban sustainable development.

GEOG 8215. Urban Identities: Explorations of Power, Inequality, and Identity in Contemporary Cities. (3) Cross-listed Course(s): GEOG 6215. Contemporary cities are idealized as cosmopolitan places inhabited by residents of different genders, ethnicities, sexualities, classes, and other identities. Yet each of these intersecting axes of difference contribute to varied experiences, struggles, and uses of urban space. This course examines the production and maintenance of relations of power, inequality, and identity in contemporary cities. Critical frameworks in feminist, critical race, sexuality, post-colonial, and intersectional theory are used to consider the ways that intersecting power relations are spatialized and embodied, shape perceptions and understanding of space and place, and contribute to struggles for the right to the city. Such frameworks are applied to urban processes and problems relating to economic restructuring, housing, poverty, public space, and social movements.

GEOG 8216. Planning for Urban Sustainability. (3) Cross-listed Course(s): GEOG 6216. Engages students in reading, discussion, and guided research on the dilemmas of urban sustainability and planning approaches to address these dilemmas. Examines the concept of sustainability critically, comparing its diverse applications and meanings as a guide for decisions in the built environment. Explores the social and physical structures that make radical change difficult, as well as innovations in city planning like ecological footprinting, climate action planning, smart growth, bus rapid transit, energy-efficient technologies, the sharing economy, and grassroots movements for alternative communities like ecovillages. Although the course engages scholarship from all over the world, and explores innovations in Latin American and some European cities, most of the discussion focuses on problems and solutions specific to the United States.

GEOG 8220. Human-Environment Interactions. (3) Cross-listed Course(s): GEOG 6220. Prerequisite(s): Permission of instructor. Investigates the inter-relationships between humans and their natural or physical environments. Topics include: human subsistence strategies, natural resource use, and human impact upon vegetation, soil, water, landforms, and climate.

GEOG 8221. Global Ecosystems. (3) Cross-listed Course(s): GEOG 6221. A multi-disciplinary course which surveys the history and prehistory of human ecological dynamics, drawing on geology, geography, and ecology to understand the interrelationships between global environmental systems and their inhabitants. Topics include: climatic change and its impacts on biological systems, peopling of new landscapes, anthropogenic vegetation change, extinctions, desertification, invasive species interactions, and changes in human subsistence.

GEOG 8222. Quaternary Paleoenvironmental Sciences. (3) Cross-listed Course(s): ESCI 6222, GEOG 6222, and INES 8222. A multi-disciplinary course which surveys methods used to reconstruct past climates, past environments and past landscapes during the Quaternary period. Changes in past environmental conditions are discussed in light of present and future landscape predictions emphasizing both natural and human causes. Focuses on biotic and abiotic material from terrestrial and marine sediment cores, ice cores, and other proxies for past environments and past climates.

GEOG 8223. Landscape Assessment. (4) Cross-listed Course(s): ESCI 6105. An advanced geomorphology course that examines current climatic and/or tectonic geomorphology research topics and methods with a focus on regional or disciplinary issues that varies each offering. Using a variety of field-based quantitative and qualitative techniques such as laser surveys, GPS, trenching and/or

coring, students devise and implement a research project that includes two related but separate field sites. Three hours seminar per week with three or four mandatory field trips.

GEOG 8224. Biogeochemical Cycles. (3) Cross-listed Course(s): ESCI 6202. Examines the Earth's water and major elemental cycles including those of carbon, nitrogen, sulfur, phosphorus and the major crustal elements. Uncertainties in the current state of understanding of global elemental cycles are also explored. Special emphasis is placed on how these cycles are currently being modified through human activities.

GEOG 8225. Biogeography. (3) Cross-listed Course(s): GEOG 6225. Introduction to the field of biogeography, the study of the distribution of organisms across space and time. Foundational theories and principles in biogeography, as well as emerging research frontiers, are covered in lectures and student-led group discussions of weekly readings.

GEOG 8226. Landscape Ecology. (3) Cross-listed Course(s): ESCI 6226, GEOG 6226, and INES 8226. An introduction to landscape ecology, the study of the interplay between spatial pattern and ecological process. Lectures and in-depth group discussions focus on the fundamental and applied aspects of topics such as habitat fragmentation, animal movement in human-dominated landscapes, landscape legacies, road ecology, and landscape planning.

GEOG 8227. Ecosystem Restoration. (3) Cross-listed Course(s): ESCI 6227, GEOG 6227, and INES 8227. Ecosystem restoration has long been used as a method to return the natural structure and function to degraded ecosystems. This course examines the theory and methods used in restoration with a focus on both terrestrial and freshwater ecosystems. Focuses on the science and policy of ecosystem restoration and uses examples from ecosystems around the world.

GEOG 8229. Geochemical Tracers and Hydrologic Applications. (3) Cross-listed Course(s): ESCI 6229, GEOG 6229, and INES 8229. Examines environmental tracers in surface and subsurface hydrology (streams, lakes, and groundwater) using an applied approach. Tracer techniques include geochemical element fingerprinting, stable isotopes, and residence time estimation.

GEOG 8282. CyberGIS and Big Data. (3) Cross-listed Course(s): GEOG 6282. Prerequisite(s): GEOG 8125. CyberGIS and Big Data represent two emerging themes in the study of geographic information science. As geospatial technologies advance, big spatial data are increasingly available. However, the processing and analytics of these big spatial data represent a challenge. Cyberinfrastructure-enabled GIS (i.e., CyberGIS) provides solid support for

resolving this challenge. The significance of CyberGIS in handling big spatial data analytics has been well recognized. This course focuses on the key capabilities of CyberGIS: high-performance and parallel spatial computing, spatial cloud computing, and big data analytics. It also exposes students to cutting-edge cyberinfrastructure theories, methods, and geospatial applications. Students benefit from this course by learning how to leverage state-of-the-art cyberinfrastructure-enabled GIS technologies for the resolution of complex spatiotemporal problems. With training from cyber-enabled GIS and big data, students are very productive in their specific domains and competitive in their future career.

GEOG 8300. Applied Regional Analysis. (3) Cross-listed Course(s): GEOG 6300. Prerequisite(s): Basic computer skills including spreadsheets. Introduction to methods and techniques used in regional analysis. Topical areas include data sources and collection, regional delineation, community and regional profiles, regional accounts, methods of analysis and impact assessment. Topics are discussed in terms of theory, use, and role in economic geography and regional development. Emphasis is placed on application of economic and demographic methods at the regional level.

GEOG 8302. Regional Economic Development. (3) Cross-listed Course(s): GEOG 6302 and PPOL 8642. Neo-classical and contemporary theories of trade, economic geography and urban and regional development. Topics include: theories of urban and regional growth, location theories including industry, central places and growth centers; human capital, labor force and entrepreneurial contributions to growth; policy dimensions of urban growth and development are addressed from theoretical and empirical perspectives.

GEOG 8304. The Transforming North Carolina Economy. (3) Cross-listed Course(s): GEOG 6304. Prerequisite(s): Permission of instructor. An examination of the contemporary and historic forces which shape the economic geography of the state. Themes examined will include human-land interactions, past and present economic transitions and the rural-urban balance within the state. Emphasis on understanding the economic forces which will most dramatically impact the future. Seminar format.

GEOG 8408. Spatial Optimization. (3) Cross-listed Course(s): GEOG 6408. Prerequisite(s): GEOG 5120 or permission of instructor. Spatial Optimization is articulated around the explicit use of GIS tools and techniques to solve coverage, distance-decay problems as well as routing problems integrating geographic information. Case studies in various domains such as urban retailing or transportation. Problem formulation and solution

techniques to optimally preserve existing natural reserves, such as reservoir resources or locating natural corridors between biologically rich areas to protect diversity.

GEOG 8500. Urban Planning: Theory and Practice. (3)

Cross-listed Course(s): GEOG 6500 and PPOL 8616. Critical assessment of alternative planning theories and their application to planning practices. Examination of economic, political, social, cultural and geographical factors affecting the operations of cities and resource distribution.

GEOG 8600. Transportation Policy. (3) Cross-listed

Course(s): GEOG 6600 and PPOL 8613. Examination of surface transportation from a public policy perspective. Institutional components and role of government at all levels influencing investment; changes in technology, environment, security, safety, equity, cost-effectiveness, public health and welfare are covered.

GEOG 8632. Ph.D. Professional Development Seminar in Geography. (1)

Facilitates professional development and community building among doctoral students enrolled in the Geography program and focuses on skills needed beyond the classroom and lab. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit one time.*

GEOG 8800. Directed Problems in Geography. (1 to 4)

Cross-listed Course(s): GEOG 6800. Individual research into geographic topics. *May be repeated once for credit with change of topic.*

GEOG 8901. Dissertation. (1 to 9) Prerequisite(s): Successful

completion of qualifying examinations. Under the direction of a dissertation advisor and committee, students design and execute an original research study. This study should address a significant issue or problem related to geography. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit (required minimum total of 18 credit hours).*

Geology (GEOL)

GEOL 5000. Topics in Geology. (1 to 4) Prerequisite(s): ESCI 1101, GEOL 1200, and GEOL 1200L; or permission of instructor. In-depth treatment of specific topics selected from one of the fields of geology. *May be repeated for credit with change of topic.*

GEOL 5100. Igneous and Metamorphic Petrology. (4)

Prerequisite(s): GEOL 3115. Classification, mineralogy and chemical properties of igneous and metamorphic rocks including the tectonic processes by which they formed.

Lab emphasizes hand specimen and petrographic description and interpretation of rocks in thin sections.

GEOL 5105. Geomorphology. (4) Cross-listed Course(s):

GEOL 4105. Prerequisite(s): ESCI 1101, GEOL 1200, and GEOL 1200L. Discusses surficial processes and landform development as controlled by climate, tectonics, rock characteristics and time. An emphasis is placed on field-based analyses of weathering, erosion, mass wasting (landslides and rock falls), and surface water processes (flooding and floodplains), and how climate change and tectonics may affect them in landscape development.

GEOL 5110. Stratigraphy. (4) Prerequisite(s): GEOL 1210 and

GEOL 3124. Vertical and horizontal relationships of layered earth materials as a key to understanding basin history, past depositional environments and their transformation through time. Three lecture hours, three lab hours per week.

GEOL 5115. Applied Geophysics. (4) Cross-listed Course(s):

GEOL 4115. Prerequisite(s): GEOL 1200 or permission of instructor. Instrumental analysis of Earth's geophysical parameters. Study of human-induced seismic and electrical signals, and natural magnetic and gravitational fields for the purposes of locating faults, ore bodies, ground water, and geotechnical or archaeological targets. Three hours of lecture and one three-hour lab per week.

GEOL 5130. Optical Mineralogy. (4) Prerequisite(s): GEOL

3115. Light optics theory, the behavior of plane polarized light in a solid medium. The laboratory emphasizes the use of petrographic microscope oil immersion techniques and identification of the common rock forming minerals. Three hours of lecture and one three-hour lab per week.

GEOL 5135. Tectonics. (4) Prerequisite(s): GEOL 3130 or

permission of instructor. A systematic examination of the evolution and dynamics of the earth from the perspective of plate tectonics theory. Three lecture hours, one three-hour lab per week.

GEOL 5140. Coastal Geology. (3) Prerequisite(s): GEOL

1200 and GEOL 1210, or permission of instructor. Examination of coastal environments, sediments, and wave-related processes in the present and geologic past. Topics include: barrier-island and salt-marsh development, sea-level fluctuations, and the relationship between human development and natural hazards. Three hours seminar per week and one mandatory two-day field trip.

GEOL 5145. Hydrogeology. (4) Prerequisite(s): GEOL 1200

or ESCI 1101; and CHEM 1251; or permission of instructor. Fundamentals of physical and chemical groundwater hydrology. Principles of flow, transport, and chemical reactions in aquifers and the vadose zone, including groundwater-surface water interactions. Three hours of

lecture and three hours of lab per week, with occasional field trips.

GEOL 5165. Aqueous and Environmental Geochemistry. (3)

Prerequisite(s): CHEM 1251, CHEM 1252, and GEOL 1200, or equivalent; or permission of instructor. Water-rock interaction and processes controlling the chemical composition of natural waters (streams, lakes, and groundwater). Topics include: the carbonate system, mineral precipitation/dissolution, redox reactions, and metal speciation.

GEOL 5175. Geochemistry. (3) Prerequisite(s): CHEM 1251, GEOL 1200, and GEOL 1200L; or permission of instructor.

Geochemical survey of origin, evolution and present composition of the earth.

GEOL 5185. Mineralogy, Economics and the Environment. (3)

The origin, distribution, and consumption rate of the Earth's mineral resources. This lecture-based course promotes an understanding of not only the geologic, engineering and economic factors that govern mineral production, but also the resulting environmental pollution problems.

GEOL 5310. Applied Soil Science. (4) Prerequisite(s): ESCI 4210, ESCI 5210, or permission of instructor. Read and discuss current literature pertaining to the application of soils to various fields of research such as surficial processes, active tectonics, ecology, stratigraphy, archaeology, and environmental assessment. Topics covered vary depending on the interests of the students. Students create and execute a semester-long soils-based field or laboratory research project of their choosing. Three hours seminar, three hours field or lab each week.

GEOL 6101. Earth Systems Analysis: Geodynamics. (3)

Current working hypotheses and research methods are reviewed for the study of crustal and lithospheric processes on time scales from the seismic cycle to the long-term geologic evolution of basins and mountain belts and on physical scales ranging from the fracture and flow of rock masses to regional deformation and mountain building.

GEOL 6102. Earth Systems Analysis: Paleoenvironments. (3)

Current working hypotheses and research methods are reviewed for the study of paleoenvironments. The interrelationships of tectonics, sediment supply and eustasy, and their effects on paleogeography and biogeography are discussed, and compared to studies of analogous modern depositional environments.

GEOL 6800. Individual Study in Geology. (1 to 4)

Prerequisite(s): Permission of instructor and credit hours established in advance. Tutorial study or special research

problems. *May be repeated for credit with change of topic.*

German (GERM)

GERM 5050. Special Topics in German. (1 to 3)

Prerequisite(s): Post-baccalaureate status, B.A. in German, or permission of department. Treatment of a special group or figure in German literature, specialized topic in German culture or language, or special problems in German conversation. *May be repeated for credit with change of topic.*

GERM 5800. Directed Individual Study. (1 to 3)

Prerequisite(s): Post-baccalaureate status, B.A. in German, or permission of department. Individual work on a selected area study. To be arranged with the instructor, generally during the preceding semester, and by special permission only. *May be repeated for credit.*

Graduate Life and Learning (GRAD)

GRAD 6000. Topics in Graduate Professional Development. (1 to 3)

Cross-listed as GRAD 8000. Various professional development topics are offered through this course. The topics relate to the professional competencies that guide professional development training for graduate students at UNC Charlotte, such as leadership, communications, teaching, writing, or professional ethics. *May be repeated with change of topic.*

GRAD 6009. Topics in Graduate Studies. (3) Cross-listed as GRAD 8009. Specialized topics in graduate studies. *May be repeated for credit with change in topic.*

GRAD 6100. Basic Statistics and Probability. (3)

Basic statistics and probability theory that prepares students for linear regression. Students are expected to learn SAS, STATA, and R during the course of the semester by participating in modules offered by Project Mosaic. By the end of the semester, students should know the steps that need to be taken to clean data prior to analysis, strategies for combining data, basic descriptive statistics. They will also understand sampling theory, inferential statistics, and sampling distributions. *May not be repeated for credit.*

GRAD 6101. Linear Regression. (3)

Cross-listed as GRAD 8101. Prerequisite(s): GRAD 6100 or equivalent. Linear regression models, and the ordinary least squares (OLS) estimators that are often used to estimate them, are robust tools employed by social scientists to both explain and predict social phenomena. Moreover, basic linear

regression and OLS are part of the foundation one must have to understand more sophisticated variants of the linear model (e.g., time series, structural equations), as well as non-linear models (e.g., logistic regression, multinomial logit, Poisson regression). As such, the class has two primary purposes: 1) conveying a basic understanding of the linear regression model so that students are able to both employ the technique in their own research and comprehend research employing the technique; and 2) provide a strong foundation in the underlying model such that they will have little difficulty in future classes that move beyond the OLS framework. *May not be repeated for credit.*

GRAD 6102. Categorical Outcomes. (3) Cross-listed as GRAD 8102. Prerequisite(s): GRAD 6101 or equivalent. While linear models like ordinary least squares regression are robust and useful, they are only applicable when your dependent variable is continuous and uncensored. Unfortunately, social scientists often want to explain phenomena that are "limited" in that they are not continuous and/or uncensored. Fortunately, there are alternative estimation techniques for analyzing most models with non-continuous (e.g., dichotomous, nominal, ordinal) and/or censored (e.g., event count or event history) dependent variables. A variety of techniques are examined for estimating models with "limited" dependent variables. *May not be repeated for credit.*

GRAD 6103. Classificatory Methods and Time Series. (3) Cross-listed as: GRAD 8103. Prerequisite(s): GRAD 6101 or equivalent. Introduction to three methods for analyzing quantitative data that are used frequently in social science and policy research. These are two classificatory methods, factor analysis and cluster analysis, and an extensive overview of time series analysis. Students are required to be familiar with the principles of statistical analysis and, in particular, with regression analysis to be enrolled in this class. *May not be repeated for credit.*

GRAD 6104. Spatial Statistics. (3) Cross-listed as GRAD 8104, GEOG 6120, GEOG 8120, and INES 8090. Prerequisite(s): GRAD 6101 or equivalent. Introduction to modern spatial statistics methods and their applications for the analysis of spatial data. Fundamental characteristics of spatial data, including spatial dependence, stationarity, and isotropy are covered. Three main categories of spatial statistics are given focus: spatial point pattern analysis, spatial prediction and geostatistics, and spatial regression. Hands-on practices are given to facilitate the understanding of theories and methods of spatial statistics. *May not be repeated for credit.*

GRAD 6151. Professional Communications. (1) Cross-listed as GRAD 8151 and BINF 8151. Principles and useful techniques for effective oral presentations, poster presentations, scientific writing, use of references and

avoiding plagiarism. Students critique and help revise each other's presentations and learn how to avoid common pitfalls. In addition, students learn how to properly organize and run a meeting. Students prepare a CV, job application letter, and job talk.

GRAD 6201. Teaching at the University Level. (3) Cross listed as GRAD 8201. Designed for graduate students who teach or intend to teach in the future. Topics include: developing a teaching philosophy, constructing a syllabus, using student demographics and learning styles in course design, managing controversial topics, incorporating active learning and critical thinking, constructing rubrics, assessment, and applying theories of cognitive development, learning, and motivation to the classroom. Students lecture throughout the semester in order to gain teaching experience and to benefit from peer review.

GRAD 6202. Teaching at American Colleges or Universities: Perspectives for International Students. (3) Cross-listed as GRAD 8202. This course, which offers the same curriculum and pedagogy as GRAD 6201 and GRAD 8201, is designed for and offered to international graduate students who wish to teach at American colleges or universities. The unique perspectives and cultural experiences of international graduate students are sought and utilized in covering such topics as developing a teaching philosophy, constructing a syllabus, understanding American students' demographics and learning styles, incorporating active learning and critical thinking, constructing rubrics for use in testing and grading, and applying theories of learning and motivation to the classroom. From this foundation, students teach during class meetings to gain experience and benefit from peer review. Language support is offered as needed.

GRAD 6210. Graduate-Level Writing for International Students. (3) Cross-listed as GRAD 8210. Designed to benefit English as a Second Language (ESL) graduate students and serves as an introduction to concepts central to graduate-level writing in the United States, such as academic integrity, audience awareness, discipline-specific variation in writing norms and culture, and rhetorical purpose. *Graded on a Pass/Unsatisfactory basis.*

GRAD 6212. Academic Writing. (3) Cross-listed Course(s): GRAD 8212. Prerequisite(s): GRAD 6210 (for non-native English-speaking graduate students). Benefits graduate students who are actively writing empirical journal articles, theses, and dissertations. Attention is given to both producing features of effective research writing and implementing strategies to successfully produce such writing. *Graded on a Pass/Unsatisfactory basis.*

GRAD 6240. Research Ethics in the Biological and Behavioral Sciences. (3) Cross-listed as PHIL 6240. Designed to identify the fundamental elements that

characterize not only methodologically grounded but also morally appropriate scientific research. Class discussion and readings focus on key issues in biological and behavioral research including informed consent, privacy and confidentiality, risk-benefit assessments, mechanisms for protecting animal and human research subjects, international research, vulnerable populations, conflicts of interest and data management, publication ethics, intellectual property issues and the politics of research.

GRAD 6302. Responsible Conduct of Research. (2) Cross-listed as GRAD 8302. An introduction to several aspects of a successful professional career emphasizing research. Designed to benefit graduate students across the University. Focuses on practical skills and critical thinking about the responsible conduct of research, highlighting the nine areas of instruction required by the National Institutes of Health (NIH) and National Science Foundation (NSF). Features several different speakers with expertise in various areas of professionalism and research ethics.

GRAD 6304. Intrapreneurship for Non-Business Majors - The Practice of Internal Entrepreneurs. (2) Introduces the concepts and application of intrapreneurship (organizational internal entrepreneurship) in order to utilize the student's disciplinary expertise in an organization. The basics of the practice of entrepreneurship in and by organizations in three ways are covered. First, why internal entrepreneurship? Second, what are the challenges for innovation within an organization? Third, how do you become entrepreneurial?

GRAD 6320. Personal Career Branding: Identity, Management, and Promotion. (2) Cross-listed as GRAD 8320. Students learn how to identify meaningful career paths, manage their preparation towards various careers, and understand how to best promote themselves to future employers. Students also gain practice and knowledge around their strengths, values, personality, effective communication, and organizational evaluation as it relates to their professional career journey. Developing and practicing core career competencies contribute to students' overall career brand, confidence level around their career path, and their connection to targeted industries of choice.

GRAD 6330. Workplace Communications. (2) The principles of good communication in the workplace, focusing on the special needs of writing in technical fields such as health, the sciences, and business. Emphasis is placed on communicating effectively in an increasingly diverse world.

GRAD 6340. Data Analysis and Visualization. (2) Cross-listed as GRAD 8340. Prerequisite(s): Enrollment in a graduate program at UNC Charlotte, with an undergraduate or graduate degree that includes some

science, math, statistics, finance, or other quantitative coursework. Utilizes the scientific method, advanced Excel, Tableau and other emerging tools to explore data beyond students' fields of study. Students (1) learn to clean-up and organize data that is not their own; (2) perform sensitivity analysis and hypothesis testing in Excel; (3) create visualizations in Tableau; (4) use visualizations to perform data analysis for discovery and storytelling.

GRAD 6350. Leadership Essentials. (2) Cross-listed Course(s): GRAD 8350. Provides students clarity as to who they are as leaders. They have the opportunity to get in touch with their strengths and identify where there are opportunities for growth, while understanding various leadership styles. Students are better equipped to effectively manage their work and relationships and to be more productive in their organizations. They understand how to apply different leadership practices in different settings.

GRAD 6360. The Art of Effective Speaking. (2) Cross-listed course(s): GRAD 8360. In this advanced oral presentation skills class, graduate students will use a systematic approach to improve their presentation skills in order to be more effective and confident in spoken interactions in personal, academic, and professional situations such as interviews, meetings, and presentations. The instructor and other students provide helpful coaching and tips.

GRAD 6370. Navigating Graduate School as a First-Generation Scholar. (2) Cross-listed Course(s): GRAD 8370. This is an elective, professional development course designed to support graduate students navigating their academic and professional contexts as first generation scholars. The course will help students identify and define how their individual identities, experiences and skills can be leveraged to progress through the potentially challenging and isolating environment of graduate life.

GRAD 6380. Personal Finance. (2) Cross-listed Course(s): GRAD 8380. Personal finance is twofold. First, a deep dive into the facts, figures, concepts, and knowledge necessary to make sound financial decisions is necessary. Equally important is the self-assessment and personal reflection regarding a person's emotions, attitudes, experiences, culture, and motivations when it comes to money. This course will guide students through both of these domains so that learners possess the knowledge and skills necessary to make appropriate financial decisions while also developing the behavioral and emotional capacity to act upon what they have learned.

GRAD 7800. Master's Thesis - Graduate Full-Time Enrollment. (3) Master's students pursuing the thesis option only may enroll in this course if they have: (1) completed all required coursework, and (2) submitted required milestone forms to the Graduate School (Comprehensive Exam

Report or Portfolio or Study Report, Thesis Committee form, and Proposal Defense form). Students registered for this course are considered "full-time enrolled." *May be repeated with permission of Graduate School.*

GRAD 7999. Master's Graduate Residency Credit. (1)

Prerequisite(s): Permission of the Graduate School. Meets Graduate School requirement during final term prior to graduation for students who need enrollment while completing the thesis defense within the first 4 weeks of the term, finishing a non-credit-bearing capstone, or finishing an Incomplete-graded course. This course is non-graded, and credit for this course does not count toward the degree. *May not be repeated.*

GRAD 8000. Topics in Graduate Professional Development. (1 to 3)

Cross-listed as GRAD 6000. Various professional development topics are offered through this course. The topics relate to the professional competencies that guide professional development training for graduate students at UNC Charlotte, such as leadership, communications, teaching, writing, or professional ethics. *May be repeated with change of topic.*

GRAD 8009. Topics in Graduate Studies. (3) Cross-listed as GRAD 6009. Specialized topics in graduate studies. *May be repeated for credit with change in topic.*

GRAD 8100. Accelerated Introduction to Quantitative Techniques. (2) Prerequisite(s): Enrollment in doctoral program at UNC Charlotte. A two week course intended to prepare students for required core economics and statistics courses. Covers math basics, a brief introduction to calculus (single variable derivatives and integrals), fundamentals of probability and an introduction to statistical software. *May not be repeated for credit.*

GRAD 8101. Linear Regression. (3) Cross-listed as GRAD 6101. Prerequisite(s): GRAD 6100 or equivalent. Linear regression models, and the ordinary least squares (OLS) estimators that are often used to estimate them, are robust tools employed by social scientists to both explain and predict social phenomena. Moreover, basic linear regression and OLS are part of the foundation one must have to understand more sophisticated variants of the linear model (e.g., time series, structural equations), as well as non-linear models (e.g., logistic regression, multinomial logit, Poisson regression). As such, the class has two primary purposes: 1) conveying a basic understanding of the linear regression model so that students are able to both employ the technique in their own research and comprehend research employing the technique; and 2) provide a strong foundation in the underlying model such that they will have little difficulty in future classes that move beyond the OLS framework. *May not be repeated for credit.*

GRAD 8102. Categorical Outcomes. (3) Cross-listed as GRAD 6102. Prerequisite(s): GRAD 8101 or equivalent. While linear models like ordinary least squares regression are robust and useful, they are only applicable when your dependent variable is continuous and uncensored. Unfortunately, social scientists often want to explain phenomena that are "limited" in that they are not continuous and/or uncensored. Fortunately, there are alternative estimation techniques for analyzing most models with non-continuous (e.g., dichotomous, nominal, ordinal) and/or censored (e.g., event count or event history) dependent variables. A variety of techniques are examined for estimating models with "limited" dependent variables. *May not be repeated for credit.*

GRAD 8103. Classificatory Methods and Time Series. (3)

Cross-listed as: GRAD 6103. Prerequisite(s): GRAD 8101 or equivalent. Introduction to three methods for analyzing quantitative data that are used frequently in social science and policy research. These are two classificatory methods, factor analysis and cluster analysis, and an extensive overview of time series analysis. Students are required to be familiar with the principles of statistical analysis and, in particular, with regression analysis to be enrolled in this class. *May not be repeated for credit.*

GRAD 8104. Spatial Statistics. (3) Cross-listed as GRAD 6104, GEOG 6120, GEOG 8120, and INES 8090.

Prerequisite(s): GRAD 8101 or equivalent. Introduction to modern spatial statistics methods and their applications for the analysis of spatial data. Fundamental characteristics of spatial data, including spatial dependence, stationarity, and isotropy are covered. Three main categories of spatial statistics are given focus: spatial point pattern analysis, spatial prediction and geostatistics, and spatial regression. Hands-on practices are given to facilitate the understanding of theories and methods of spatial statistics. *May not be repeated for credit.*

GRAD 8151. Professional Communications. (1) Cross-listed as GRAD 6151 and BINF 8151. Principles and useful techniques for effective oral presentations, poster presentations, scientific writing, use of references and avoiding plagiarism. Students critique and help revise each other's presentations and learn how to avoid common pitfalls. In addition, students learn how to properly organize and run a meeting. Students prepare a CV, job application letter, and job talk.

GRAD 8201. Teaching at the University Level. (2 to 3)

Cross listed as GRAD 6201. Designed for graduate students who teach or intend to teach in the future. Topics include: developing a teaching philosophy, constructing a syllabus, using student demographics and learning styles in course design, managing controversial topics, incorporating active learning and critical thinking,

constructing rubrics, assessment, and applying theories of cognitive development, learning, and motivation to the classroom. Students lecture throughout the semester in order to gain teaching experience and to benefit from peer review. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8202. Teaching at American Colleges or Universities: Perspectives for International Students. (3) Cross-listed as GRAD 6202. This course, which offers the same curriculum and pedagogy as GRAD 6201 and GRAD 8201, is designed for and offered to international graduate students who wish to teach at American colleges or universities. The unique perspectives and cultural experiences of international graduate students are sought and utilized in covering such topics as developing a teaching philosophy, constructing a syllabus, understanding American students' demographics and learning styles, incorporating active learning and critical thinking, constructing rubrics for use in testing and grading, and applying theories of learning and motivation to the classroom. From this foundation, students teach during class meetings to gain experience and benefit from peer review. Language support is offered as needed. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8210. Graduate-Level Writing for International Students. (3) Cross-listed as GRAD 6210. Designed to benefit English as a Second Language (ESL) graduate students and serves as an introduction to concepts central to graduate-level writing in the United States, such as academic integrity, audience awareness, discipline-specific variation in writing norms and culture, and rhetorical purpose. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8212. Academic Writing. (3) Cross-listed Course(s): GRAD 6212. Prerequisite(s): GRAD 6210 or GRAD 8210 (for non-native English-speaking graduate students). Benefits graduate students who are actively writing empirical journal articles, theses, and dissertations. Attention is given to both producing features of effective research writing and implementing strategies to successfully produce such writing. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8240. Research Ethics in the Biological and Behavioral Sciences. (3) Cross-listed as PHIL 8240. Designed to identify the fundamental elements that characterize not only methodologically grounded but also morally appropriate scientific research. Class discussion and readings focus on key issues in biological and behavioral research including informed consent, privacy and confidentiality, risk-benefit assessments, mechanisms for protecting animal and human research subjects, international research, vulnerable populations, conflicts of interest and data management, publication ethics, intellectual property issues and the politics of research. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8302. Responsible Conduct of Research. (2) Cross-listed as GRAD 6302. An introduction to several aspects of a successful professional career emphasizing research. Designed to benefit graduate students across the University. Focuses on practical skills and critical thinking about the responsible conduct of research, highlighting the nine areas of instruction required by the National Institutes of Health (NIH) and National Science Foundation (NSF). Features several different speakers with expertise in various areas of professionalism and research ethics. *Required course for all doctoral students. Graded on a Pass/Unsatisfactory basis.*

GRAD 8320. Personal Career Branding: Identity, Management, and Promotion. (2) Cross-listed as GRAD 6320. Students learn how to identify meaningful career paths, manage their preparation towards various careers, and understand how to best promote themselves to future employers. Students also gain practice and knowledge around their strengths, values, personality, effective communication, and organizational evaluation as it relates to their professional career journey. Developing and practicing core career competencies contribute to students' overall career brand, confidence level around their career path, and their connection to targeted industries of choice. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8340. Data Analysis and Visualization. (2) Cross-listed as GRAD 6340. Prerequisite(s): Enrollment in a graduate program at UNC Charlotte, with an undergraduate or graduate degree that includes some science, math, statistics, finance, or other quantitative coursework. Utilizes the scientific method, advanced Excel, Tableau and other emerging tools to explore data beyond students' fields of study. Students (1) learn to clean-up and organize data that is not their own; (2) perform sensitivity analysis and hypothesis testing in Excel; (3) create visualizations in Tableau; (4) use visualizations to perform data analysis for discovery and storytelling.

GRAD 8350. Leadership Essentials. (2) Cross-listed Course(s): GRAD 6350. Provides students clarity as to who they are as leaders. They have the opportunity to get in touch with their strengths and identify where there are opportunities for growth, while understanding various leadership styles. Students are better equipped to effectively manage their work and relationships and to be more productive in their organizations. They understand how to apply different leadership practices in different settings. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8360. The Art of Effective Speaking. (2) Cross-listed course(s): GRAD 6360. In this advanced oral presentation skills class, graduate students will use a systematic approach to improve their presentation skills in order to be more effective and confident in spoken interactions in

personal, academic, and professional situations such as interviews, meetings, and presentations. The instructor and other students provide helpful coaching and tips. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8370. Navigating Graduate School as a First-Generation Scholar. (2) Cross-listed Course(s): GRAD 6370. This is an elective, professional development course designed to support graduate students navigating their academic and professional contexts as first generation scholars. The course will help students identify and define how their individual identities, experiences and skills can be leveraged to progress through the potentially challenging and isolating environment of graduate life. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8380. Personal Finance. (2) Cross-listed Course(s): GRAB 6380. Personal finance is twofold. First, a deep dive into the facts, figures, concepts, and knowledge necessary to make sound financial decisions is necessary. Equally important is the self-assessment and personal reflection regarding a person's emotions, attitudes, experiences, culture, and motivations when it comes to money. This course will guide students through both of these domains so that learners possess the knowledge and skills necessary to make appropriate financial decisions while also developing the behavioral and emotional capacity to act upon what they have learned. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8610. Making Dissertations Happen: Managing Writing and Life. (3) Prerequisite(s): Enrollment in doctoral program and actively writing dissertation. Designed to help doctoral-level writers be more resilient in the face of numerous potential challenges by providing support in the dissertation process. Focuses on best practices for improving writing productivity, managing stress and procrastination, dealing with adversity during the dissertation process, and strengthening and maintaining key relationships. Structured to cultivate community among dissertation writers, because writers can benefit from peer support during the dissertation process. *Graded on a Pass/Unsatisfactory basis.*

GRAD 8990. Academic Integrity. (0) Online training addressing issues of academic integrity and the University's policy and procedures related to violations. Required of all new doctoral students. *No credit, non-graded.*

GRAD 9800. Doctoral - Graduate Full-Time Enrollment Credit. (3) Prerequisite(s): Permission of the Graduate School. Doctoral students who have: (1) completed all required coursework and (2) submitted required milestone paperwork to the Graduate School (Exam Report of Comprehensive Examination, Appointment of Doctoral Dissertation Committee or DNP Scholarly Project form, and the Proposal Defense form) may register for this

course and be considered "full-time enrolled" students. *May be repeated with permission of Graduate School.*

GRAD 9999. Doctoral Graduate Residency Credit. (1) Prerequisite(s): Permission of the Graduate School. Meets Graduate School requirement during final term prior to graduation for students who need enrollment while completing the dissertation defense within the first 4 weeks of the term, finishing a non-credit-bearing capstone, or finishing an Incomplete-graded course. Grading Method: This course is non-graded, and credit for this course does not count toward the degree. *May not be repeated.*

Gerontology (GRNT)

GRNT 5050. Topics in Gerontology. (1 to 4) Investigation of specific issues in Gerontology, either from the perspective of a single discipline or from a multidisciplinary perspective. *May be repeated for credit with change of topic.*

GRNT 5250. Aging Programs and Services. (3) Examination of federal, state and local framework of services and programs for the aging. Graduate students required to complete a more extensive final paper.

GRNT 5260. Women: Middle Age and Beyond. (3) Position of older women in society and the particular problems and issues for women as they age.

GRNT 5280. The Experience of Dementia. (3) Cross-listed Course(s): SOWK 4280. Provides an overview of Alzheimer's disease and related disorders using a person-centered perspective. This topic is explored from the perspectives of the person diagnosed, family members and concerned friends, and both informal and formal caregivers. Students who successfully complete this course will gain a holistic insight into these disorders and their implications for both individuals and society.

GRNT 5290. The Experience of Loneliness. (3) Cross-listed Course(s): GRNT 4290, SOCY 4290, and SOCY 5290. Explores the experience of loneliness among older adults in society. Drawing on academic texts, empirical research and personal accounts of loneliness, the aim is to identify the extent of loneliness experienced by older adults in various contexts. In particular, the readings consider the consequences of loneliness on the physical, mental, and social well-being of older adults.

GRNT 5353. Environments for Aging. (3) Cross-listed Course(s): SOWK 4353. With roots in environmental psychology, this course explores the ways in which older adults experience and interact with their physical environment at both the macro and micro levels. Students

are introduced to the values and practices of a broad spectrum of housing alternatives for an aging population, which include traditional and household models of long term care, therapeutic environments for individuals with dementia, Naturally Occurring Retirement Communities (NORCS), as well as co-housing and intentional community options.

GRNT 5365. Grief and Loss Across the Lifespan. (3) Cross-listed Course(s): GRNT 4365, SOWK 4365, and SOWK 5365. Equips the professional practitioner to understand and respond effectively to individuals, families, groups, organizations, and communities experiencing both symbolic and tangible losses and accompanying grief reactions. Topics include: theories of normal and complicated grief, factors that influence grief at different stages of the lifespan, cultural and spiritual influences, traumatic loss, anticipatory grief and end of life care, the impact of loss and working in close contact with grief on professionals, and skills and strategies that address therapeutic needs of vulnerable and resilient populations experiencing grief.

GRNT 6050. Topics in Gerontology. (3) Prerequisite(s): Permission from graduate program director. Investigation of specific issues in Gerontology, either from the perspective of a single discipline or from a multidisciplinary perspective.

GRNT 6124. Psychology of Aging. (3) Cross-listed Course(s): PSYC 6124. Psychology of aging with particular emphasis on issues related to community / clinical psychology and industrial / organizational psychology. Topics include: myths and stereotypes about aging, problems faced by older workers, retirement, mental health and normal aging, counseling the older adult, and psychological disorders in later life.

GRNT 6130. Sociology of Aging: Theories and Research. (3) Cross-listed Course(s): SOCY 6130. Application of stratification theories and demography are applied to the older population. Issues of race, gender, socio-economic status, age, and geographic distribution are examined to investigate the diversity of the older age group and their access to resources.

GRNT 6134. Family Caregiving Across the Lifespan: Theory, Practice, and Policy. (3) Cross-listed Course(s): SOCY 6134 and SOCY 6134. Theories explaining the formation and functioning of American families with an emphasis on the impact of the aging of society. Examines the current demographic trends and expectations of multigenerational families, with a focus on family caregiving. Addresses family care across the lifespan as a lifelong developmental construct, and examines evidence-based approaches to practice, education, research, and policy. Students examine a broad spectrum of care

situations (from developmental disability to chronic illness, dementia care, and end of life) that necessitate family caregiving throughout the lifespan and discuss responses to these challenges by both caregiving families and caregiving systems.

GRNT 6201. Research and Methods in Aging I. (3)

Prerequisite(s): Statistics. Examination of variety of qualitative and quantitative methods used in research on aging and analysis of Gerontology research from a range of disciplines. Students will develop a working draft of their thesis-applied project proposal.

GRNT 6202. Research and Methods in Aging II. (3)

Prerequisite(s): GRNT 6201. Examination of the variety of qualitative and quantitative methods used in evaluation research in applied settings. Students will develop an evaluation project plan.

GRNT 6210. Aging and Public Policy. (3) Cross-listed

Course(s): MPAD 6210. Examination of the public policy making process with attention to aging policy. Consideration of determinants of aging policy and institution and actors in the policy making process and piecemeal development of legislation will be analyzed as factors related to the making of policy for the aged.

GRNT 6211. Administration of Aging Programs. (3) Cross-

listed Course(s): MPAD 6211. Focus will be implementation of public policies and programs for the aged and the development and administration of these programs. Students will become familiar with the process through which policies are transformed into aging programs and the budgetary, management and evaluative considerations that must be taken into consideration.

GRNT 6275. Health Promotion, Nutrition, and Wellness for Older Adults. (3) Cross-listed Course(s): NURS 6275.

Explores self-care measures and health promotion practices with an emphasis on nutrition, that promote a healthy lifestyle in later life. Topics include: principles of teaching and learning adapted to diverse older adults' needs and learning styles. Common barriers to healthcare and appropriate nutrition in older adults are also examined. Current findings from research will be integrated throughout the course. A foundational knowledge of human development is expected.

GRNT 6400. Practicum. (3) Completion of a field-based educational experience which relates to the student's career goals and objectives. *Graded on a Pass/Unsatisfactory basis.*

GRNT 6600. Current Issues in Aging. (3) We are all aging every day and older adults are found in every sector of society. This course equips students across a variety of disciplines and career fields with an understanding of the

experiences related to aging across the lifecourse. Using a multidisciplinary and interdisciplinary approach, students explore relevant issues we face as we age, discuss potential solutions, and formulate policy proposals and recommendations to enhance the quality of life of all of us as we age. This course is a foundational course in the graduate certificate in gerontology and serves to ground students in essential and core gerontological frameworks, concepts, and theories.

GRNT 6800. Independent Research in Gerontology. (3) Graduate students meet individually or in small groups with the instructor and will complete readings and/or research on a topic in gerontology according to a contract. Attendance at lectures of an undergraduate course in Gerontology may be included among course requirements. *May be repeated for credit up to 6 credits.*

GRNT 6990. Applied Project. (3) Prerequisite(s): Permission of graduate program director. Individual project based on directed study of a topic in gerontology. *Graded on a Pass/Unsatisfactory basis.*

GRNT 6999. Master of Arts Thesis. (6) Prerequisite(s): Admission to the M.A. in Gerontology thesis option. The thesis is coordinated with the student's interests and practical experience to allow the development of an area of specialization. A completed paper and oral presentation are required. *Graded on a Pass/Unsatisfactory basis.*

Health Administration (HADM)

HADM 6000. Topics in Health Administration. (3) Intensive study of a topic in health administration. The topic of investigation may vary from semester to semester. *May be repeated for credit.*

HADM 6100. Introduction to the U.S. Healthcare System. (3) Prerequisite(s): Enrollment in MHA, MPH, or M.S. or Graduate Certificate in Health Informatics and Analytics. Overview of healthcare delivery in the United States including organizational structures, financing mechanisms and delivery systems, with particular attention to program formation.

HADM 6104. Population Health and Disease. (3) Cross-listed Course(s): HCIP 6104. Principles and methods of managerial epidemiology grounded in foundational public health knowledge, spanning the social ecological model; essential services, models of health, illness, and disease, including modes of disease transmission and characterization of risk; and paradigms of health promotion and disease prevention within a global, systemic view of health (e.g., One Health).

HADM 6108. Decision Analysis in Healthcare. (3) The study of selected quantitative management tools useful in the analysis of managerial decisions. Includes a review of basic descriptive and inferential statistics, applied probability distributions, forecasting methods, statistical process control, queuing, transportation and assignment modeling, and linear programming. The emphasis is on applying quantitative decision making methods to the operational problems facing healthcare organizations. Familiarity with computers and computer software will be important for success in this course.

HADM 6116. Accounting for Healthcare Management. (3) Basic concepts and techniques of collecting, processing and reporting financial information relevant to healthcare institutions. Emphasizes a conceptual understanding of financial accounting, technical tools of cost accounting, including budget preparation and analysis, and interpretation of financial statements.

HADM 6120. Health Economics. (3) Examination of the economic context of health services delivery and policies, and application of economic concepts to the healthcare sector including supply and demand, elasticity, regulation, competition, and cost effectiveness analysis.

HADM 6124. Marketing in Healthcare. (3) Provides an in-depth understanding of the essential concepts of marketing and their application to healthcare. Students gain a working knowledge of marketing tools and how to use them in the context of healthcare. Students build practical applied skills in analyzing healthcare marketing problems and developing healthcare marketing programs and strategies. Students also expand their understanding of the differences and similarities between health services and social marketing.

HADM 6128. Human Resources Management. (3) Examines human resources management as it applies to health services institutions, including compensation benefits, personnel planning, recruitment, selection, training and development, employee appraisal and discipline, union-management relations, and quality management.

HADM 6134. Quality and Outcomes Management in Healthcare. (3) Cross-listed Course(s): HCIP 6134. Examination of the concepts and practices of quality management, performance improvement, and assessment of outcomes in healthcare delivery settings. Designed to provide an in-depth understanding of basic concepts and frameworks and of their applicability and relevance in specific situations. Examples of topics to be covered include: process reengineering, service improvement, continuous quality improvement, accreditation standards, patient satisfaction, outcome measurement, teamwork, and case management.

HADM 6138. Healthcare Finance. (3) Prerequisite(s): HADM 6116. Fundamental financial management concepts and tools for healthcare institutions, including financial statements and attributes, capital acquisition and allocation, investment analysis, capital and cash flow management, and contractual relationships.

HADM 6142. Health Policy Development. (3) Cross-listed Course(s): MPAD 6174. Prerequisite(s): HADM 6100. Examination of the formulation, adoption and implementation of public policy for health services delivery and healthcare through federal, state, and local political processes.

HADM 6145. Organization Behavior in Healthcare. (3) Introduction to organizational theory with applications to healthcare systems, including organizational design and inter-organizational networks/alliances. Examination of communication and leadership skills development, including conflict, labor, and dispute management.

HADM 6146. Information Resources Management. (3) Cross-listed Course(s): HCIP 6146. A study of the use of information management to improve the delivery of healthcare. Information resource management includes methods and practices to acquire, disseminate, store, interpret, and use information to provide healthcare in a more efficient, effective and economical manner. Emphasis is placed upon information as central to the ongoing operations and strategic decisions of healthcare organizations.

HADM 6150. Health Law and Ethics. (3) Cross-listed Course(s): HCIP 6150. Analyzes fundamental principles of law, ethics, and the legal system as a framework for healthcare delivery and public health practice in the United States.

HADM 6154. Strategic Management of Health Services Organizations. (3) Prerequisite(s): Permission of department. Analysis of strategic planning, managing and marketing concepts, techniques and tools within the healthcare industry, including organizational capability analysis and business plan development. This is the Master of Health Administration (MHA) Capstone Course that should be taken during the MHA student's final semester.

HADM 6200. Health Insurance and Managed Care. (3) Fundamentals of managed healthcare systems, including risk arrangements, compensation, incentives, quality assurance, financing, and public programs.

HADM 6210. Medical Practice Management. (3) Cross-listed Course(s): HCIP 6330. A comprehensive study of medical practice management and the issues, tools, and techniques to resolve those issues. Provides the student with an understanding of the financial and regulatory

issues that influence today's medical practice with an insight into the cultural, human resource, and governance issues that make physician practices unique among healthcare organizations.

HADM 6234. Performance Improvement Project Management in Healthcare: An Introduction to Lean Six Sigma. (3) Introduction to the Lean Six Sigma performance improvement methodology, with a focus on application within the healthcare domain. Students learn the tools and methods that are used to improve existing processes and design new, efficient processes by eliminating process waste. Also explored are analytical techniques that allow students to measure and monitor process performance.

HADM 6400. Health Administration Internship. (3) Prerequisite(s): HADM 6100 and 15 additional credit hours of core course requirements. Provides students at the midpoint of their MHA Program supervised, hands-on, administrative experience in a healthcare setting in which to apply foundational knowledge and self-assess competence, career goals, and educational needs.

HADM 6800. Health Administration Independent Study. (1 to 3) Guided individual study in an issue related to health administration arranged with a faculty member or supervised experience in an administrative setting in a program or entity within the healthcare delivery system. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

Health Informatics and Analytics (HCIP)

HCIP 5121. Information Visualization. (3) Cross-listed Course(s): ITCS 5121. Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program; and full graduate standing. Information visualization concepts, theories, design principles, popular techniques, evaluation methods, and information visualization applications.

HCIP 5122. Visual Analytics. (3) Cross-listed Course(s): DSBA 5122. Prerequisite(s): HCIP 6380 or permission of instructor; and enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program, or the MPH program. Introduces the new field of visual analytics, which integrates interactive analytical methods and visualization. Topics include: critical thinking, visual reasoning, perception/cognition, statistical and other analysis techniques, principles of interaction, and applications.

HCIP 5160. Applied Databases. (3) Cross-listed Course(s): ITIS 6120 and ITIS 8120. Prerequisite(s): Enrollment in the

PSM or Graduate Certificate in Health Informatics and Analytics and full graduate standing required. Identification of business database needs; requirements specification; relational database model; SQL; E-R modeling; database design, implementation, and verification; distributed databases; databases replication; object-oriented databases; data warehouses; OLAP; data mining; security of databases; vendor selection; DBMS product comparison; database project management; tools for database development, integration, and transaction control.

HCIP 5166. Network-Based Application Development. (3)

Cross-listed Course(s): ITIS 5166. Prerequisite(s): Enrollment in the PSM or Graduate Certificate in Health Informatics and Analytics and full graduate standing. Examines the issues related to network based application development. Topics include: introduction to computer networks, web technologies and standards, network based programming methodologies, languages, tools, and standards.

HCIP 5250. Computer Forensics. (3) Cross-listed Course(s):

ITIS 5250. Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. The identification, extraction, documentation, interpretation, and preservation of computer media for evidentiary purposes and/or root cause analysis. Topics include: techniques for discovering digital evidence; responding to electronic incidents; tracking communications through networks; understanding electronic media, crypto-literacy, data hiding, hostile code, and Windows™ and UNIX™ system forensics; and the role of forensics in the digital environment.

HCIP 5376. Introduction to Programming for Health Informatics. (3) Prerequisite(s): Enrollment in the PSM or

Graduate Certificate in Health Informatics and Analytics program, or the MPH program. An introduction to the fundamentals of computer programming, the course provides students essential programming knowledge and skills to perform commonly encountered computational tasks in the field of health informatics. Prepares students for advanced programming and data science courses.

HCIP 6070. Current Issues in Health Informatics. (3)

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Current topics and issues related to Health Informatics and Analytics, including health policy analysis and development, ethical issues, structure of health administrative and delivery systems, assessment of population health, models of healthcare delivery, access and quality of care issues.

HCIP 6102. Healthcare Data Analysis. (3) Prerequisite(s):

Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program, MPH program, or Graduate Certificate in Applied Nursing Informatics

program. Develops skills in the management, analysis, and reporting of health data, including introductory applied statistical analysis. Students use statistical software (such as SAS, R, or Python) to run analyses and generate quantitative evidence to inform public health, health policy, healthcare operational, and clinical decision-making that improves quality, adjusts for risk, quantifies access, measures population health, and evaluates policies and programs. Focuses on interpreting and visualizing statistical output to generate reports and develop clinical, financial, and operational recommendations for communication to stakeholders. Touches upon SQL, qualitative methods, and application of legal and ethical precepts to healthcare data analysis.

HCIP 6103. Big Data Analytics for Competitive Advantage. (3) Cross-listed Course(s): DSBA 6100 and ITCS 6100.

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. An introduction to the use of big data as a strategic resource. A focus is placed on integrating the knowledge of analytics tools with an understanding of how companies leverage data analytics to gain strategic advantage. A case approach is used to emphasize hands-on learning and a real-world view of big data analytics.

HCIP 6104. Health and Disease. (3) Cross-listed Course(s):

HADM 6104. Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Principles and methods of epidemiology, including definitions and models of health, illness, and disease; modes of transmission of clinically important infectious agents; risk factors and chronic diseases; and insights into existing studies and paradigms of health promotion and disease prevention.

HCIP 6108. Intermediate Decision Analysis in Healthcare. (3) Prerequisite(s): HCIP 5376; and enrollment in the PSM or

Graduate Certificate in Health Informatics and Analytics program, or the MPH program. Addresses the use of quantitative management tools for medical decision-making in populations. Topics include: the use of decision trees, Markov models, Monte Carlo simulation, and forecasting methods to address uncertainty in decision-making. Students work in cluster teams to complete assignments, culminating in a real-world decision model addressing a current medical decision.

HCIP 6112. Software System Design and Implementation. (3) Cross-listed Course(s): ITCS 6112 and ITIS 6112.

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Introduction to the techniques involved in the planning and implementation of large software systems. Emphasis on applying quantitative decision making methods to the operational problems facing healthcare organizations.

Familiarity with computers and computer software will be important for success in this course.

HCIP 6134. Quality and Outcomes Management in Healthcare. (3) Cross-listed Course(s): HADM 6134.

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Examination of the concepts and practices of quality management, performance improvement, and assessment of outcomes in healthcare delivery settings. Designed to provide an in-depth understanding of basic concepts and frameworks and of their applicability and relevance in specific situations. Topics include: process reengineering, service improvement, continuous quality improvement, accreditation standards, patient satisfaction, outcome measurement, teamwork, and case management.

HCIP 6146. Information Resources Management. (3) Cross-listed Course(s): HADM 6146. Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. A study of the use of information management to improve the delivery of healthcare. Information resource management includes methods and practices to acquire, disseminate, store, interpret and use information to provide healthcare in a more efficient, effective and economical manner. Emphasis is placed upon information as central to the ongoing operations and strategic decisions of healthcare organizations.

HCIP 6150. Health Law and Ethics. (3) Cross-listed Course(s): HADM 6150. Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Analysis of ethical and bioethical problems confronting healthcare delivery systems. Selected legal principles and their application to the healthcare field, including corporate liability, malpractice, informed consent and governmental regulation of health personnel and health facilities.

HCIP 6156. Applied Machine Learning. (3) Cross-listed Course(s): DSBA 6156. Prerequisite(s): Full graduate standing and enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Practical perspectives and applications of machine learning methods and techniques including: acquisition of declarative knowledge; organization of knowledge into new, more effective representations; development of new skills through instruction and practice; and discovery of new facts and theories through observation and experimentation.

HCIP 6160. Database Systems for Data Scientists. (3) Cross-listed Course(s): DSBA 6160. Prerequisite(s): Enrollment in the PSM or Graduate Certificate in Health Informatics and Analytics or MPH programs. The modeling, programming, integration, and provenance of big data. Focuses on SQL and NoSQL, but may also address other advanced topics. Topics include: (1)

modeling/theory: basics of RDBMS and NoSQL, database design; (2) programming: SQL and NoSQL query languages; (3) integration: data warehousing, preprocessing; (4) databases in the Cloud; and (5) provenance: data version control, data lifecycle management.

HCIP 6162. Knowledge Discovery in Databases. (3) Cross-listed Course(s): DSBA 6162, ITCS 6162, and ITIS 6162.

Prerequisite(s): ITCS 6160 or ITIS 6120; and Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Exploration of the entire knowledge discovery process. Topics include: setting up a problem, data preprocessing and warehousing, data mining in search for knowledge, knowledge evaluation, visualization and application in decision making. A broad range of systems, such as OLAP, LERS, DatalogicR+, C4.5, AQ15, Forty-Niner, CN2, QCRAS, and discretization algorithms are also covered.

HCIP 6167. Network Security. (3) Cross-listed Course(s): ITIS 6167. Prerequisite(s): ITIS 6200 or equivalent and Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Examines the issues related to network security. Topics include: network security background and motivation, network centric threats, network authentication and identification, network security protocols, firewall, IDS, security in wireless environments, email security, instant message security, network application security, and network based storage security. There are heavy lab based components in this course.

HCIP 6200. Principles of Information Security and Privacy. (3) Cross-listed Course(s): ITIS 6200 and ITIS 8200.

Prerequisite(s): Permission of department. Topics include: security concepts and mechanisms; security technologies; authentication mechanisms; mandatory and discretionary controls; basic cryptography and its applications; database security, intrusion detection and prevention; assurance requirement, assurance class, evaluation methods and assurance maintenance; anonymity and privacy issues for information systems.

HCIP 6201. Health Information Privacy and Security: Law, Ethics, and Technology. (3) Prerequisite(s): Enrollment in PSM in Health Informatics and Analytics program. A foundational exposure to legal and ethical issue related to health information privacy and security and the basic technological considerations to meet those professional obligations in health informatics practice.

HCIP 6210. Access Control and Security Architecture. (3) Cross-listed Course(s): ITIS 6210. Prerequisite(s): ITIS 6200 and Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Discusses objectives, formal models, and mechanisms for access control; and

access control on commercial off-the-shelf (COTS) systems. Examines the issues related to security architectures and technologies for authorization. Topics include: cryptographic infrastructure, distributed systems security architectures, database systems security architectures, Internet security architectures, network security architectures, and e-commerce security architectures.

HCIP 6213. Applied Healthcare Business Analytics. (3)

Cross-listed Course(s): DSBA 6213 and MBAD 6213. Pre-requisites: Demonstrated proficiency with Microsoft Excel; STAT 5123, HADM 6108 (for students with background in healthcare administration), HCIP 6108 (for students with background in healthcare informatics), or equivalent. Focuses on applying business analytics within the healthcare setting. Students learn analytical tools used to synthesize big data into meaningful management information that is used in making key business decisions that impact the delivery of healthcare services. Case studies are utilized to prepare students for delivering boardroom level presentations of their findings.

HCIP 6230. Enterprise and Infrastructure Protection. (3)

Cross-listed Course(s): ITIS 6230 and ITIS 8230. Prerequisite(s): ITIS 6200; and enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Methodologies, tools, and technologies that are important for protecting data and network security in both enterprises and critical infrastructures. Topics include: the prevent-detect-response strategy for enterprise security, policies, techniques, processes and methodologies for risk assessment and management, infrastructure reconnaissance and vulnerability analysis, basics of forensics, methodologies for continuous operation and recovery from disasters.

HCIP 6250. Problem-Solving in Healthcare Analytics. (3)

Prerequisite(s): Permission of department. This course is intended to be taken after all program- and concentration-specific core courses are completed, preferably in the last semester of the degree. An advanced course with synthesis and application of strategic planning, information technology, and analytic concepts via "real world" consultative projects grounded in health informatics and analytics.

HCIP 6275. AI in Healthcare. (3) Prerequisite(s): HCIP 6156, DSBA 6156, or per instructor approval. Artificial Intelligence (AI) has played an important role in improving the quality and efficiency of healthcare. Especially in recent years, with the dramatic increase of the volume and richness of healthcare data and the advent of machine learning and deep learning methods, numerous AI models and applications have been reported to achieve near expert performance or even surpass expert performance in some scenarios. However, successful deployment of AI

applications in real-world clinical practice is still rare, broad acceptance of these new technologies is even more challenging. In this course, we will first quickly review major AI models and methods that have been developed in the healthcare domain and then spend most of our time examining the many critical aspects of investigations that are necessary to translate AI models and methods that have been successfully tested in the laboratory settings into real world healthcare settings.

HCIP 6322. Complex Adaptive Systems. (3) Cross-listed

Course(s): DSBA 6322, ITCS 6322, ITCS 8322, ITIS 6322, and ITIS 8322. Prerequisite(s): Permission of instructor, and enrollment in MS or Graduate Certificate in Health Informatics and Analytics program. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), nonlinear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. Covers the above and similar topics in an interactive manner. Examples of our current research effort are provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity.

HCIP 6326. Network Science. (3) Cross-listed Course(s):

DSBA 63260, ITIS 6326, and ITIS 8326. Prerequisite(s): Full graduate standing or permission of department. Network Science helps students design faster, more resilient communication networks; revise infrastructure systems such as electrical power grids, telecommunications networks, and airline routes; model market dynamics; understand synchronization in biological systems; and analyze social interactions among people. It examines the various kinds of networks (regular, random, small-world, influence, scale-free, and social) and applies network processes and behaviors to emergence, epidemics, synchrony, and risk. Integrates concepts across computer science, biology, physics, social network analysis, economics, and marketing.

HCIP 6330. Medical Practice Management. (3) Cross-listed

Course(s): HADM 6210. Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. A comprehensive study of medical practice management and the issues, tools, and techniques to resolve those issues. Provides the student with an

understanding of the financial and regulatory issues that influence today's medical practice with an insight into the cultural, human resource, and governance issues that make physician practices unique among healthcare organizations.

HCIP 6342. Health Information Technology Project Management. (3) Cross-listed Course(s): ITIS 6342.

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Introduces students to problems associated with managing information technology projects involving, particularly, integration of systems, development of client-specific solutions, and project justification. Moves beyond the classic techniques of project management and integrates communication software/systems, multi-site, multi-client facilities projects, cultural issues involved with managing interdisciplinary teams, and the effect of rapid technological obsolescence on project justification, funding and continuance.

HCIP 6380. Introduction to Health Informatics. (3)

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program, MPH program, or Graduate Certificate in Applied Nursing Informatics program. An introduction to fundamental terminologies, concepts, and techniques in health informatics. Exposes students to important and current topics, including electronic medical records (EMR), Electronic Health Records (EHR), health data and standards, sourcing, and analytics methods in administrative, clinical, and financial aspects of healthcare.

HCIP 6385. Healthcare Communication and Leadership. (3)

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Principles and useful techniques for effective oral presentations, poster presentations, scientific writing. Students critique and help revise each other's presentations and learn how to enhance communications. Students learn how to properly organize and run a meeting. Also covers negotiation, conflict management, and influence. Students use several approaches to evaluate their individual leadership style. Completes a management style assessment, and analyzes leadership styles of prominent leaders in the eHealth environment, using contemporary leadership theory and principles. Primarily covers AHIMA HIM competency III.A.

HCIP 6390. Advanced Programming for Health Informatics. (3)

Prerequisite(s): Enrollment in PSM or Graduate Certificate in Health Informatics and Analytics program. Examines advanced use of object-oriented programming and scripting techniques applied to case studies in health informatics development. Emphasizes programming techniques beyond the fundamentals, with emphasis on efficiency in speed, data structures and file size. Students learn how to optimize code and databases

so that the demands of large-scale health information systems can be performed in acceptable amounts of time while minimizing hardware requirements. Topics include: algorithm optimization, optimization of database queries and development for software as a service.

HCIP 6393. Healthcare Information Systems and Data Integration. (3) Pre- or Corequisite(s): HCIP 5376, HCIP 6160

and enrollment in Graduate Certificate in Health Informatics and Analytics program. Provides a systematic understanding and experience of foundational concepts and techniques for information systems and data integration in healthcare. Topics include: information systems in healthcare, electronic health record (EHR) systems, heterogeneous data sources in healthcare, health data interoperability, health communications standards, health data standards, health data integration architecture, and health data integration models and techniques, including data preparation, health data integration tools, and health information exchange.

HCIP 6396. Business Intelligence in Healthcare. (3)

Prerequisite(s): HCIP 5376 and HCIP 6380. Business Intelligence is a collection of computer-based techniques used to extract, identify and analyze data. Analytics is key in the transformation of the healthcare industry. Healthcare business intelligence can provide organizations with the ability to improve quality of care, increase financial efficiency and operational effectiveness, conduct innovative research, and satisfy regulatory requirements. Business Intelligence provides better access to information. It provides current and predictive views across the enterprise. Common functions of BI are reporting, data mining, analytical processing, knowledge management, and data visualization. Topics include: elements of business intelligence, business analytics, data visualization, data mining, data warehousing, and business performance management.

HCIP 6400. Health Informatics and Analytics Internship Project. (3) Prerequisite(s): HADM 6100; HCIP 6380;

enrollment in M.S. in Health Informatics and Analytics program with a minimum of 12 program credit hours completed, including the designated prerequisites; and permission of instructor. Provides students who are at the midpoint of their M.S. in Health Informatics and Analytics program supervised hands-on experience in a healthcare setting. Students apply foundational knowledge in a field setting and reflect on their competence, career goals, and educational needs through a presentation and written report.

HCIP 6800. Health Informatics and Analytics Independent Study. (1 to 3)

Prerequisite(s): Enrollment in PSM in Health Informatics and Analytics program; and permission of instructor. Guided individual study in an issue related to health informatics and analytics arranged with a faculty

member, or a supervised experience in a health analytics setting. *May be repeated with change of topic/deliverables up to 6 credit hours.*

History (HIST)

HIST 5000. Problems in American History. (3)

Prerequisite(s): Permission of the department. A readings course designed around a problem in American history, requiring reading, discussion, reports and a major paper. *May be repeated for credit with change of topic.*

HIST 5001. Problems in European History. (3)

Prerequisite(s): Permission of the department. A readings course designed around a problem in European history, requiring reading, discussion, reports and a major paper. *May be repeated for credit with change of topic.*

HIST 5002. Problems in Non-Western History. (3)

Prerequisite(s): Permission of the department. A readings course designed around a problem in non-Western history, requiring reading, discussion, reports and a major paper. *May be repeated for credit with change of topic.*

HIST 5600. Research Seminar in History. (3) Cross-listed Course(s): HIST 4600. A research seminar course designed around a specific problem in History, requiring reading, discussion, reports and a major research paper. *May be repeated for credit with change in topic.*

HIST 5797. Honors Methods and Practice - Early Entry. (3)

Cross-listed Course(s): HIST 4797. Prerequisite(s): HIST 2600, Departmental Honors, and Early Entry status. This course is open only to students pursuing both undergraduate honors and an Early Entry Master's degree. It is the first course in a required two-course sequence for Honors in History, and it substitutes for HIST 4797. It prepares students for the research and writing of an honors thesis by providing training in historiography, research methods, source development, and writing. During the course, students meet separately with their thesis advisor to craft their prospectus. Students must achieve a grade of A, or a grade of B with permission of instructor, to be able to take the next course in the sequence, HIST 4799 or HIST 5799. Students must achieve a grade of C to satisfy major requirements.

HIST 5799. Honors Research and Thesis - Early Entry. (3)

Cross-listed Course(s): HIST 4799, Departmental Honors, and Early Entry status. Prerequisite(s): HIST 4797 or HIST 5797. This course is open only to students pursuing both undergraduate honors and an Early Entry Master's degree. It is the final course in a required two-course sequence for Honors in History. It involves the preparation and presentation of an acceptable Honors thesis or its equivalent. A grade of A is required to earn honors.

HIST 6000. Topics in History. (3) Prerequisite(s): Permission of the department. Intensive treatment of a period or broader survey of a topic, depending on student needs and staff resources. *May be repeated for credit with change of topic.*

HIST 6001. Colloquium in United States History Before 1865. (3)

Prerequisite(s): Permission of the department. A reading colloquium focused on the major events and historiographical approaches in U.S. history to the Civil War.

HIST 6002. Colloquium in United States History Since 1865. (3)

Prerequisite(s): Permission of the department. A reading colloquium focused on the major events and historiographical approaches in U.S. history since the Civil War.

HIST 6101. Colloquium in 19th-Century European History. (3)

Prerequisite(s): Permission of the department. A reading colloquium focused on the major events and historiographical approaches in European history during the long 19th Century (1789-1914).

HIST 6102. Colloquium in 20th-Century European History. (3)

Prerequisite(s): Permission of the department. A reading colloquium focused on the major events and historiographical approaches in European history from World War I to the late 20th Century.

HIST 6201. Colloquium in Colonial Latin American History. (3)

Cross-listed Course(s): LTAM 6251. Prerequisite(s): Permission of the department. A topical colloquium devoted to selected themes in colonial Latin American history. Provides an introduction to research methods, documentary sources, and the critical analysis of historical literature. Topics will change. *May be repeated for credit.*

HIST 6202. Colloquium in Modern Latin American History. (3)

Cross-listed Course(s): LTAM 6252. Prerequisite(s): Permission of the department. A topical colloquium devoted to selected themes in modern Latin American history. Provides an introduction to research methods, documentary sources, and the critical analysis of historical literature. Topics will change. *May be repeated for credit.*

HIST 6300. Topics in Public History. (3)

Prerequisite(s): Permission of department. Intensive treatment of a field of public history, depending on student needs and staff resources. *May be repeated for credit with change of topic.*

HIST 6310. Museum Studies. (3) Prerequisite(s): Permission of the department. Introduces students to the management, curatorial, public relations, and fundraising aspects of historical museums and related historical sites.

These skills are acquired through readings, term projects, and a “hands-on” experience at local museums and historical sites.

HIST 6320. Historic Preservation. (3) Prerequisite(s): Permission of the department. An introduction to the theory and practice of identifying, preserving and restoring buildings, sites, structures and objects in the historic built environment of the United States.

HIST 6330. History in the Digital Age. (3) Prerequisite(s): Permission of the department. Analyzes the impact of new media technology on the discipline of history as well as the ways in which new media enhances the discipline by making history accessible to a much broader audience. Involves a new media project that will require students to learn to work as a team, important to their preparation for careers in public history settings. Coursework includes common readings of texts and encounters with online studies, with emphasis on the media projects.

HIST 6400. Internship. (3) Prerequisite(s): Permission of the Director of Public History and faculty advisor. Completion of 145 hours of work as an intern, plus a journal and reflection paper.

HIST 6693. Historiography and Methodology. (3) Prerequisite(s): Six hours of graduate study in History and permission of the department. A study of historians and their philosophical and methodological approaches. Required of all M.A. candidates.

HIST 6694. Seminar in Historical Writing. (3) Prerequisite(s): HIST 6693 with grade of B or above, and permission of department. Seminar on the process of writing a history thesis, including evidence, argument, narrative, and organization. In this seminar, students write a thesis chapter or research paper. Required of all M.A. candidates.

HIST 6894. Readings in History. (3) Prerequisite(s): Prior written permission of instructor and Graduate Program Director. Coverage of historical periods or topics through individually designed reading programs; scheduled conference with a staff member. *May be repeated for credit.*

HIST 6901. Directed Readings/Research. (3) Prerequisite(s): Prior written permission of instructor and Graduate Program Director. Directed readings/research in conjunction with an undergraduate lecture course taught by a member of the Department of History graduate faculty. Students attend all lectures in the course and are expected to do additional graduate level reading and written work as assigned by the faculty member. This includes, but is not limited to, a 20-25 page paper.

HIST 6997. Directed Research. (3) Prerequisite(s): Prior written permission of instructor and Graduate Program Director. Investigation of a historical problem culminating in a research paper. *May be repeated for credit.*

HIST 6998. Exam Preparation. (3) Prerequisite(s): Permission of department. Preparation for comprehensive exams in three fields of historical study.

HIST 6999. Thesis. (3 or 6) Appropriate research and written exposition of research is required. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit by permission, if taken for three credit hours. Six credit hours of Thesis may be taken during a single semester.*

Public Health (HLTH)

HLTH 5000. Topics in Public Health. (3) Courses in selected topics and advanced studies in public health. *May be repeated for credit with change of topic.*

HLTH 5090. International Comparative Health Systems. (3) Cross-listed Course(s): HLTH 4090, NURS 6090, and SOWK 5126. A study tour to explore the cultures, social, and healthcare systems outside the United States. Participants visit a variety of healthcare sites and attend presentations by practitioners and educators. They have opportunities to interact with people from the host countries and visit a variety of cultural and historic sites.

HLTH 5206. Interprofessional Approaches to Suicide Prevention. (3) Prerequisite(s): Admission to Master of Public Health program or permission of instructor. Guided by suicide prevention and interprofessional (IPE) competencies, students are exposed to multi-level influences on suicide and its prevention. Topics include: suicide prevention-related ethical issues, terminology, attitudes and social norms, vulnerable populations, risk/protective factors, and mental health services and public health approaches to suicide prevention.

HLTH 6000. Special Topics in Public Health. (3) Courses in selected topics and advanced studies in public health. *May be repeated for credit with change of topic.*

HLTH 6101. International Health. (3) Principles and methods of studying international health, including historical background, sources and problems associated with health data, the social context, the role of government and non-government agencies, health in relation to environment and development, international health projects, defining the international health sector, infectious disease problems, and the practice of international health.

HLTH 6103. Maternal and Child Health Systems. (3)

Prerequisite(s): Graduate standing. An overview of maternal and child health (MCH) service delivery systems at the federal, state, and local levels. Topics focus on the evidence-base for programs and funding mechanisms for the major programs for women, infants, and children. Attention is on levels of prevention and access to health services and programs, as well as the services and programs as a health system for vulnerable women, reproductive health, infants, and children. Analysis of the health systems considers the life course perspective, human development, health behavior and communication, and public policy.

HLTH 6104. Population Perspectives on Nutrition and Physical Activity. (3)

Prerequisite(s): Enrollment in MPH or M.S. in Kinesiology, or permission of instructor. Students learn about common nutrition and physical activity recommendations and how they differ, common measures used to assess population nutrition and physical activity, U.S. food and physical activity policy, global nutrition, and physical activity issues. Differences in diet and physical activity behavior among various populations are also studied.

HLTH 6200. Case Studies in Public Health. (3)

Prerequisite(s): Graduate standing. Introduction to the profession of public health, including the evolution and historical background of public health practice. Students learn the various paradigms that govern public health practice and the essential skills in critical thinking and group process needed to be effective in the field. Students also analyze a series of public health problems in the form of case studies using a watch, read, investigate, test/teach and evaluate (WRITE) technique.

HLTH 6202. Community Epidemiology. (3)

Prerequisite(s): Enrollment in MPH program or permission of instructor. Principles and methods of epidemiology including definitions and models of health, illness and disease; modes of transmission of clinically important infectious agents; risk factors and chronic diseases; and insights into existing studies and paradigms of health promotion and disease prevention.

HLTH 6211. Evidence-Based Methods in Public Health. (3)

Prerequisite(s): Enrollment in MPH program or permission of instructor. Introduction to basic concepts and principles of epidemiology and biostatistics with an emphasis on addressing public health problems in practical settings. Students develop skills to analyze public health data, using a statistical software package, such as STATA or SAS, and appropriate interpretation of results. Topics include: epidemiological study designs, descriptive epidemiological and statistical measures, standardization, measures of association and impact, sources of error, hypothesis testing, and stratified analysis.

HLTH 6212. Health Promotion Program Management. (3)

Prerequisite(s): Enrollment in MPH program or permission of instructor. An introduction to the public health core functions of: assessment, planning and assurance. Introduces basics of budgeting. Students design, implement, and evaluate a brief, community-based public health intervention.

HLTH 6213. Policy and Leadership. (3)

Prerequisite(s): Enrollment in MPH program or permission of instructor. Students examine and develop communication and leadership skills necessary for effective public health practice, including human resources management, conflict resolution, mediation and negotiation, community collaboration, and strategic planning. Students also develop an understanding of the role of law, policy, and advocacy in advancing the public's health and develop advocacy skills.

HLTH 6220. Applied Health Behavior Change. (3)

Prerequisite(s): Enrollment in MPH with Concentration in Community Health Practice or Physical Activity and Nutrition program, or permission of instructor. Introduction to important concepts and theories from the social and behavioral sciences that guide health promotion interventions targeted to changing health behaviors. Students synthesize the evidence-based health promotion literature, choose appropriate theoretical and behavioral measures to determine intervention success, and apply theory to intervention activities and programs.

HLTH 6225. Health Education and Health Promotion. (3)

Prerequisite(s): Graduate standing. Exposes students to principles, terminology, and strategies for health education in public health practice settings. Students apply and evaluate the use of health education delivery methods for various populations and community practice settings. They also explore the use of emerging technologies and social media in delivering and promoting health education. Students demonstrate how to design and communicate health information to a variety of audiences.

HLTH 6226. Community Health Methods. (3)

Prerequisite(s): HLTH 6211; and enrollment in MPH program or permission of instructor. A conceptual overview and detailed practical experience in the design and implementation of qualitative and quantitative methods in assessing, promoting, and assuring community health. Students learn and apply qualitative and quantitative methods to community health scenarios, including: in-depth interviewing, survey design and conduct, focus group discussion design and conduct, and analyzing measures. Students apply these skills to inform their understanding of the depth and breadth of community health issues.

HLTH 6227. Community Health Planning and Evaluation. (3)

Prerequisite(s): HLTH 6212; and enrollment in MPH with Concentration in Community Health Practice program or permission of instructor. Exposes students to the processes, techniques, and skills necessary to plan, to implement, and to evaluate programs related to public health. Students demonstrate their understanding of these principles and their ability to apply them in practice through the development and presentation of a comprehensive community needs assessment, a program proposal, and an evaluation plan. Particular emphasis is placed upon a social-ecological analysis of factors contributing to the understanding of, and response to, community health issues.

HLTH 6228. Social Determinants of Health. (3)

Prerequisite(s): Graduate standing. Exposure to broad social factors influencing population health. These determinants influence health status, health behavior, and healthcare utilization. Students investigate a particular social determinant and the relevant policies governing that issue in the form of a short paper. Students learn to write a concise and persuasive brief to communicate with decision-makers.

HLTH 6230. Community Health Practice Capstone. (3)

Prerequisite(s): Enrollment in MPH with Concentration in Community Health Practice or Physical Activity and Nutrition program. Pre- or Corequisite(s): HLTH 6471 or permission of instructor. The culminating, integrative curricular experience for students enrolled in the MPH program with a Concentration in either Community Health Practice or Physical Activity and Nutrition; students are required to take this class during their last semester prior to graduation. The course draws on students' prior training in the core areas of public health; their additional required coursework in their concentration; and their field experience gained in their internship or service activities. The capstone course is closely linked to the MPH internship. It is designed to challenge students to reflect and integrate their training and experience with the goal of developing their own individual point of view regarding the role of public health, but also how each student sees him/herself fitting into public health practice.

HLTH 6241. Quantitative Analysis of Health Policy. (3)

Prerequisite(s): HLTH 6211 or HADM 6108; Health Policy Concentration in MPH or HADM. Introduces and applies basic principles and statistical tools to quantitative and empirical assessments of health policy.

HLTH 6243. Fostering Health Through Policy and Action. (3)

Prerequisite(s): Enrolled in MPH or MHA program. Provides an overview of local, state, and federal advocacy processes in the United States, their potential impact on the practice of public health, and opportunities for involvement in health policy change.

HLTH 6250. Health Policy Capstone. (3) Prerequisite(s): HLTH 6471 or permission of instructor; Enrollment in MPH program with a concentration in Health Policy. The culminating, integrative curricular experience for students enrolled in the MPH program with a concentration in Health Policy.

HLTH 6260. Analytic Epidemiology. (3) Cross-listed Course(s): PPOL 8665. Prerequisite(s): HLTH 6211; and enrollment in MPH program or doctoral program, or permission of instructor. Practical experience in preparing, analyzing, and presenting findings from epidemiologic data in the form of a research report or a manuscript. Students critically examine different epidemiologic research designs, identify sources of error, and develop skills to use bivariate and multivariate approaches to analyze epidemiologic associations. Students are introduced to sources of secondary datasets and use statistical software such as STATA, SAS to perform data analysis.

HLTH 6262. Public Health Data Analysis II. (3)

Prerequisite(s): HLTH 6271; and enrollment in MPH or doctoral program, or permission of instructor. Provides the foundation skills for advance statistical methods used in the analysis of epidemiological and public health data. Emphasizes developing advanced data analysis skills using real life data. Topics include: multiple linear regression, logistic regression, Poisson regression, survey data analysis, and survival data analysis.

HLTH 6270. Epidemiologic Methods. (3) Prerequisite(s): HLTH 6211; and enrollment in MPH program or permission of instructor. Epidemiology is the study of distribution and risk factors of diseases, illnesses, and other health-related events in human population. This course is designed to further review the important concepts in epidemiologic research such as confounding, effect modification, and stratified analysis. Topics include: matching, screening, life table analysis, and survival analysis. Students gain expertise in critically reading current epidemiologic and medical literature.

HLTH 6271. Public Health Data Analysis. (3) Prerequisite(s): HLTH 6211; and enrollment in MPH program or permission of instructor. Prepares students for analysis and application of statistical methods used in epidemiologic research. After reviewing introductory concepts such as probability and probability distributions, descriptive statistics, and hypotheses testing, students are introduced to the advanced statistical methods such as multiple linear regression, logistic regression, survey data analysis, and survival data analysis. Statistical software such as STATA, SAS are used to perform data analysis.

HLTH 6273. Infectious Disease Epidemiology. (3)

Prerequisite(s): HLTH 6211 and enrollment in MPH program

or permission of instructor. Introduces the key concepts and basic research methods in infectious disease epidemiology. Students learn about causative agents, different routes of transmission (e.g., host-host, environmental transmission, vector-borne, etc.), outbreak investigation, and control/prevention strategies for a wide array of emerging and re-emerging infectious diseases, including HIV, Tuberculosis, malaria, etc. The difference between infectious and chronic diseases in epidemiological studies is also explored.

HLTH 6277. Nutritional Assessment and Epidemiology. (3)

Prerequisite(s): Enrollment in MPH or M.S. in Kinesiology. Designed for graduate students who are interested in conducting or better interpreting epidemiological studies relating diet and nutritional status to disease and health. There is an increasing awareness that various aspects of diet and nutrition may be important contributing factors in development of chronic disease. Topics include: 1) how to evaluate public health nutrition research studies; 2) the sources of available nutritional data; 3) the variety of nutritional measurement tools; and 4) how to identify appropriate nutritional measurement tools for a community-based assessment.

HLTH 6280. Epidemiology Capstone Course. (3)

Prerequisite(s): HLTH 6471 or permission of instructor, and enrollment in MPH with Concentration in Epidemiology program. A culminating experience designed for students to demonstrate their ability to integrate and apply knowledge and skills they have acquired through their prior training in the core areas of public health; epidemiology concentration coursework; and their field experience or service activities. Students work in small groups on public health problems to design and conduct field-based epidemiologic activities. Students are required to take this class during their last semester prior to graduation.

HLTH 6471. Public Health Internship. (3) Prerequisite(s):

Enrollment in MPH program, completion of 18 or more graduate credit hours, and permission of the MPH Program Director. Intensive, supervised experience in the practice of public health in community settings.

Prerequisite(s): Permission of instructor. Directed study in areas of specialization in public health and related fields. Maximum credit toward degree: three hours. *Graded on a Pass/Unsatisfactory or IP basis.*

HLTH 8000. Special Topics in Public Health Sciences. (1 to 4)

Courses in selected topics and advanced studies in public health sciences. *May be repeated for credit with change of topic.*

HLTH 8201. Introduction to Quantitative Research Design. (3)

Cross-listed Course(s): HSRD 8260. Prerequisite(s):

Enrollment in Ph.D. in Public Health Sciences program or permission of instructor. Pre- or Corequisite(s): Master's level Applied Biostatistics course or equivalent. An overview of quantitative methods as applied to design and analysis of public health and health services research problems. Topics include: categories and levels of quantitative research, characteristics of a good research design, relationship between theory and research, selection process for measurement tools, power analysis, sampling techniques, design sensitivity, and human subjects protection. An overview of qualitative research methods and their relationship to quantitative methods also are provided.

HLTH 8220. Theories and Interventions in Behavioral Science. (3)

A broad overview of theories that influence health behavior and health outcomes using the social-ecological model as a guiding framework. Focus is less on learning specific theories, and more on how to apply theories in a health intervention. Students read a variety of articles related to intervention research and identify issues that could form potential avenues of theoretical and intervention inquiry. The major emphasis is on designing a health behavior intervention using theory and writing a complete grant proposal detailing the intervention.

HLTH 8221. Qualitative Research in Behavioral Sciences. (3)

Prerequisite(s): Enrollment in Ph.D. in Public Health Sciences program or permission of instructor. Introduction to qualitative research design, data generation techniques, and analyses that lead to theory generation and identification of theoretical concepts. Students learn the philosophical basis of qualitative research, basic qualitative research designs, gain an understanding of qualitative research elements that must be addressed in a research project, and the importance of research rigor. The course explores both theoretical and practical dimensions of qualitative data collection and analyses, including identifying themes, developing and using codebooks, making systematic comparisons, and writing qualitative methods and results. Students will be introduced to qualitative analysis software for coding and managing qualitative data, and collaborate in the process of transforming qualitative data into analyses and interpretations.

HLTH 8222. Qualitative Research II: Theory Generation and Analysis in Behavioral Sciences. (3)

Pre- or Corequisite(s): HLTH 8221. Using data collected in HLTH 8221, students work in teams to analyze data from various techniques and perspectives including grounded theory to develop robust and bounded concepts. The focus is on analyzing and writing qualitative research to contribute to theory development. Students learn how to write a qualitative article for publication. Additional assignments include: developing a code book, analyzing text data using grounded theory techniques of constant comparison,

presenting findings back to your community partner agency, and writing a qualitative methods section of a research manuscript.

HLTH 8223. Social Determinants of Health. (3) The major social factors influencing health using the socio-ecological model as a guiding framework. Focus is on how differences in levels of these factors influence population health. Students read across disciplines and international boundaries to gain a broad understanding of social factors. Students write a literature review paper addressing a key social determinant and how it influences health behavior and a corresponding health outcome.

HLTH 8270. Applied Biostatistics: Regression. (3) Pre or Corequisite(s): Graduate level Introduction to Biostatistics or approved Statistics course; basic knowledge of statistical software; or permission of the instructor. To understand and apply concepts and principles of regression-based statistical methods, including linear regression, logistic regression, count regression, survival analysis, and longitudinal data analysis to health related studies. Students use statistical software for computation and develop skills for selecting appropriate methods for data analysis and interpreting the results of health-related studies in scientific and nontechnical language.

HLTH 8271. Applied Biostatistics: Multivariate Methods. (3) Prerequisite(s): HLTH 8270 or permission of instructor. An intermediate course that covers biostatistical principles and methods for analyzing discrete and continuous multivariate data: correlations, discriminant analysis, factor analysis, multivariate analysis of variance, log-linear models for contingency tables, multilevel modeling, comorbidity and competing risks, and regression methods for multivariate dependent data, such as time series and spatial data. Statistical software is used for data analysis.

HLTH 8281. Measurement and Scale Development. (3) Pre- or Corequisite(s): HLTH 8201. The conceptual aspects of quantitative measurement in the public health sciences and the practical aspects of the scale development process as applied to individual and population health status and behavioral and social determinant assessment. Students progress from a conceptual model of the health phenomenon under consideration to item development, response scaling, item selection, and scale development through reliability and validity testing. Students develop a framework for judging the appropriateness of a measure for a given situation.

HLTH 8282. Health Survey Design and Research. (3) Pre- or Corequisite(s): HLTH 8201. The practical aspects of designing (or selecting) quantitative survey instruments related to health status assessment in individuals and populations and their use in research. Building upon prior coursework and drawing upon case studies and practical

exercises, students progress from appropriately formulating questions (items) for a variety of domains to the design and layout of survey instruments and the development of survey protocols through the data entry, data cleaning, and analysis/reporting phases.

HLTH 8601. Ethics and Integrity in Health Research and Practice. (3) Examines the ethical and integrity issues health professionals may face in research, practice, teaching, and service. Topics include: responsible human and animal subjects research, including research with vulnerable populations and communities, data falsification, and fabrication; ethical issues in health program implementation; professional ethics; plagiarism; publishing ethics; and interactions with students. Fulfills the GRAD 8302 requirement.

HLTH 8602. Communicating and Disseminating Research. (1) Prerequisite(s): Enrollment in Ph.D. in Public Health Sciences program or permission of instructor. Focuses on research dissemination planning, writing for publication, presenting at professional conferences, presenting to the community, writing technical reports for funders, writing abstracts, and working with the media. Students work on a variety of assignments to gain skills related to disseminating research in different venues. *Graded on a Pass/Unsatisfactory basis.*

HLTH 8603. Teaching Portfolio. (3) Teaching strategies that focus on the major aspects of university teaching. Topics include: preparing a syllabus, creating assignments, evaluating student performance, and enhancing student learning through the use of various discussion and lecture techniques. Students work with a faculty member to develop and deliver a lecture, and develop and grade an assignment to assess students' understanding based on the delivered lecture.

HLTH 8800. Independent Study in Public Health Sciences. (1 to 6) Pre- or Corequisite(s): Full graduate standing in the PhD in Public Health Sciences program and permission of instructor. Guided individual study in topics or issues related to public health sciences arranged with a faculty advisor. *Graded on a Pass/Unsatisfactory or IP basis. May be repeated for credit.*

HLTH 8901. Dissertation Research. (3, 6, or 9) Pre- or Corequisite(s): Passing the Ph.D. in Public Health Sciences comprehensive exam and approval of the Dissertation Chair. Individual investigation that culminates in the preparation and presentation of a doctoral dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Health Psychology (HPSY)

HPSY 8050. Topics in Psychological Treatment. (3) Cross-listed Course(s): PSYC 6050. A topical course which focuses on issues in treatment, alternative treatment perspectives, special client populations. *May be repeated for credit with permission of department.*

HPSY 8099. Topics in Psychology. (3) Cross-listed Course(s): PSYC 6099. A discussion of selected topics in psychology. *May be repeated for credit with change of topic.*

HPSY 8102. Research Design and Quantitative Methods in Psychology. (3) Cross-listed Course(s): OSCI 8102. Prerequisite(s): Admission to the Ph.D. in Health Psychology program, or permission of instructor. This interdisciplinary course provides a broad overview of the major research methodologies and methodological considerations in the behavioral sciences. Using examples drawn from the literature, the course focuses on general principles and perspectives of social science research. Topics include: foundational concepts across the behavioral sciences (e.g., sampling, measurement, ethics, logic of hypothesis testing, etc.), and the evaluation of specific methodologies (e.g., experimentation, observation, survey, archival, epidemiological/ecological designs, etc.). Practical research considerations are also covered (e.g., basics of APA writing, IRB process and forms, data management and data cleaning, development of experimental protocols, etc.).

HPSY 8103. Basic Quantitative Analyses for Behavioral Sciences. (3) Cross-listed Course(s): OSCI 8103. Prerequisite(s): HPSY 8102. Introduction to quantitative data analysis and interpretation. Focuses on the strategic application of the multiple regression and correlational framework (including specific instantiations such as ANOVA, path analyses, etc.) including the incorporation of manipulated or categorical independent and categorical dependent variables.

HPSY 8104. Advanced Quantitative Analyses for Behavioral Sciences. (3) Prerequisite(s): HPSY 8103 or equivalent; admission to the Ph.D. in Health Psychology program; or permission of instructor. A topical course that focuses on selected advance quantitative analyses used within behavioral sciences. Topics may include: survival analysis, repeated measures analyses, latent model analyses, multi-level modeling, advanced categorical variable analyses, meta-analysis. *May be repeated for credit with change of topic.*

HPSY 8107. Ethical and Professional Issues in Psychology. (3) Cross-listed Course(s): PSYC 6107. Roles and

responsibilities of psychologists, including ethical standards in professional practice, testing and research; expectations and problems confronting psychologists in industrial, clinical and professional organizations.

HPSY 8141. Intellectual Assessment. (3) Prerequisite(s): HPSY 8151 or permission of department; Permission of department. Theories of intelligence and methods of intellectual assessment, including practice in administering intelligence tests, interpreting results, and writing evaluation reports. Three lecture hours.

HPSY 8142. Personality Assessment. (3) Prerequisite(s): HPSY 8151 or permission of department. Theories and methods used in the assessment of personality and psychopathology, including practice in administering personality tests, interpreting results and writing evaluation reports. Three lecture hours.

HPSY 8145. Applied Research Design and Program Evaluation. (3) Cross-listed Course(s): PSYC 6145. Prerequisite(s): PSYC 6102. Models of evaluative research; also techniques, designs and administration of program evaluation. Topics include: role conflicts, entry issues, goal setting, research for program planning and implementation and examples of actual program design and evaluation.

HPSY 8150. Introduction to Psychological Treatment. (3) Prerequisite(s): HPSY 8151. Introduction to the scientist-practitioner model and to the principles, strategies, and science behind evidence-based clinical practice for beginning therapists. It considers the mechanisms for change underlying several transdiagnostic practices and links them to commonly encountered diagnoses or symptoms patterns. Three lecture hours per week.

HPSY 8151. Psychopathology. (3) Prerequisite(s): Permission of department. Cross-listed Course(s): PSYC 6151. Current perspectives on systems of classification and diagnosis of psychopathology and maladaptive behavior, as well as the implications of these systems for psychologists. Three lecture hours per week.

HPSY 8155. Community Psychology. (3) Cross-listed Course(s): HPSY 8155. Research, intervention techniques and settings associated with major approaches in community psychology including the mental health, organizational, ecological, and social action models.

HPSY 8200. Health Psychology I. (3) Cross-listed Course(s): PSYC 6200. Prerequisite(s): Admission to the Ph.D. program in Health Psychology or permission of instructor. Intensive review of the contributions of the discipline of psychology to the promotion and maintenance of health, the prevention and treatment of illness, and the examination of health behaviors. Presents an historical overview of psychosomatic medicine and behavioral medicine. Focuses

on biological, cognitive, affective, social and developmental approaches to health and illness experiences. Topics include: stress, coping, adherence to treatment, pain, chronic disease, psychoneuroimmunology and health behavior changes among others. Emphasizes the biopsychosocial model in understanding health and disease.

HPSY 8201. Health Psychology II. (3) Prerequisite(s): HPSY 8200. Continuation of Health Psychology I.

HPSY 8240. History and Systems of Psychology. (3) Prerequisite(s): Graduate standing and permission of instructor. Explores major developments and ideas in the discipline of psychology from its founding in the late 19th century through the early 21st century. Consideration of the systems of psychology, past and present; major controversies and their relevance to contemporary psychology; and the relation between psychology and other disciplines.

HPSY 8243. Health Psychology in Action. (3) Prerequisite(s): Doctoral student standing. covers the central ideas and theories related to the role of culture, gender, and socioeconomic status in influencing behavior, cognitions, and emotions as they relate to physical and mental health outcomes. The materials reviewed examine the importance of considering the role of these factors in research, prevention and intervention efforts, treatment, and the delivery of health services.

HPSY 8245. Clinical Supervision and Consultation in Psychology (3). Prerequisite(s): doctoral graduate standing or permission of instructor. Explores major theories, approaches, and techniques in clinical supervision and consultation in professional psychology. Students are provided with the knowledge and skills necessary to work as effective clinical supervisors and psychological consultants.

HPSY 8255. Community Interventions. (3) Cross-listed Course(s): PSYC 6255. Prerequisite(s): HPSY 8155 and doctoral student standing. Intensive review of the use of system- and organizational-level interventions to promote and maintain health, prevent illness, and improve quality of life. Presents an historical overview of the effectiveness of different types of interventions, and theoretical and empirical background regarding the conditions and factors that contribute to successful community interventions. Students develop and implement a community intervention, in collaboration with a local organization, and develop a grant proposal that would fund a community intervention.

HPSY 8260. Topics in Health Psychology. (3) Prerequisite(s): HPSY 8200. An examination of selected topics in Health

Psychology. *May be repeated for credit with permission of department.*

HPSY 8262. Practicum in Health Psychology. (1 to 3)

Prerequisite(s): HPSY 8200 and permission of the department. Experience in assessment and treatment with clients at local health agencies under supervision from a faculty member on campus. Applications of the principles of health psychology to special problems with in a healthcare organization or setting. *May be repeated for credit with permission of department.*

HPSY 8450. Practicum in Clinical Psychology. (1 to 3)

Cross-listed Course(s): PSYC 6450. Prerequisite(s): HPSY 8150 and permission of department. Experience in clinical assessment and/or psychotherapy with clients at local agencies under supervision from a faculty member on campus. *May be repeated for credit with permission of department.*

HPSY 8455. Practicum in Community Psychology. (1 to 3)

Cross-listed Course(s): PSYC 6455. Applications of the principles of community psychology to special problems within an organization or community setting. The project might include, but would not be limited to, consultation, program development, training, community education or program evaluation. *May be repeated for credit with permission of department.*

HPSY 8550. Internship. (0) Prerequisite(s): Good standing in the program, completed all relevant coursework, successfully completed comprehensive examinations (clinical and programmatic), successfully proposed doctoral dissertation, and approval by the Director of Clinical Training. Placement in a pre-doctoral clinical internship at an American Psychological Association approved site or at another site approved by the Director of Clinical Training. Internship typically lasts for one continuous year. Enrollment in this cooperative course represents full-time enrollment. *Grading on a Pass/Unsatisfactory basis. May be repeated over a one year period.*

HPSY 8601. Foundations in Psychology I: Physiological, Cognitive, and Affective Basis of Human Behavior. (3)

Prerequisite(s): Enrollment in Ph.D. in Health Psychology program or permission of program. Provides foundational knowledge, as required by the APA Commission on Accreditation, for graduate training in professional psychology, with a specific focus on the areas of physiological psychology, cognitive psychology, and affective foundations. Each content area is covered in a 5-week module with additional integrative content and assignments spanning the semester.

HPSY 8602. Foundations in Psychology II: Developmental, Community, and Social Basis of Behavior. (3) Prerequisite(s): Enrollment in Ph.D. in Health Psychology program.

Introduces the fields of developmental, community, and social psychology. Explores the lifespan, contextual, and social/group perspectives on health and well-being and investigate how health and well-being are shaped by longitudinal and contextual factors across ecological levels.

HPSY 8603. Experimental Research Seminar. (1)

Prerequisite(s): Enrollment in the health psychology program or permission of the instructor. Experimental research seminar to help students develop knowledge and skills that are central to conducting experimental and social psychological research with applications to health and well-being. *May be repeated for credit up to 6 credit hours.*

HPSY 8899. Readings and Research in Psychology. (1 to 4)

Cross-listed Course(s): PSYC 6899. Prerequisite(s): Permission of instructor and department to be obtained in the semester preceding the semester in which the course is to be taken. Individual study in psychology which may take the form of conducting empirical research or formulating a critique and synthesis of existing research. *May be repeated for credit.*

HPSY 8999. Doctoral Dissertation Research. (1 to 9)

Prerequisite(s): Admission to Ph.D. in Health Psychology program, satisfactory completion of comprehensive examination, and approval of research topic by dissertation committee. Execution of original research that culminates in the preparation and presentation of a doctoral dissertation in a topic of health psychology. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Health Services Research (HSRD)

HSRD 8000. Topics in Health Services Research. (1 to 4)

Prerequisite(s): Full graduate standing in the Ph.D. in Health Services Research program or permission of the instructor. Study of selected topics in health services research. *May be repeated for credit. Graded on a Pass/Unsatisfactory basis.*

HSRD 8201. Introduction to Health Services Research. (3)

Introductory course in models, theoretical frameworks and key components of health services research. Historical development of health services research will be traced. An in-depth study of social determinants of health will be explored.

HSRD 8202. Healthcare Systems and Delivery. (3)

Prerequisite(s): Enrollment in the Ph.D. in Health Services Research program or permission of the instructor. Provides

a theoretical and empirical basis for understanding major organizational, delivery, and financing structures and related health outcomes comprising present day healthcare in the United States and globally. Evidence from health services research studies is discussed as part of the identification of key areas for future research.

HSRD 8203. Economics of Health and Healthcare. (3)

Cross-listed Course(s): ECON 6260 and PPOL 8667. Prerequisite(s): Enrollment in the interdisciplinary Ph.D. in Health Services Research program or the Ph.D. in Public Policy program, or permission of the instructor. Uses economic theory and econometrics to analyze the functioning of the healthcare sector and appropriate public policy. Topics include: how markets for medical care differ from other markets, the demand for medical care, the demand and supply of health insurance, the role of competition in medical markets, managed care, managed competition, and the role of the public sector in regulating and financing healthcare. The topic list is flexible and student input is solicited and welcomed.

HSRD 8204. Health Policy. (3)

Cross-listed Course(s): PPOL 8663. Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy or Health Services Research programs and a graduate level course providing an adequate introduction to the U.S. healthcare system such as HADM 6100 or permission of instructor. Examines the formulation, adoption, implementation, and evaluation of health policy at national, state, and local levels through extensive readings in relevant health and policy literatures.

HSRD 8260. Design of Health Services Research. (3)

Cross-listed Course(s): HLTH 8201. Prerequisite(s): Enrollment in Ph.D. in Health Services Research program or permission of instructor. Pre- or Corequisite(s): Master's level Applied Biostatistics course or equivalent. An overview of quantitative and qualitative methods as applied to design and analysis of health services research problems. Qualitative topics: overview of philosophies of qualitative inquiry, characteristics of qualitative research design, managing qualitative data, and qualitative methods. Quantitative topics: categories and levels of quantitative research, characteristics of a good research design, relationship between theory and research, selection process for measurement tools, power analysis, sampling techniques, design sensitivity, and human subject protection.

HSRD 8261. Healthcare Program Evaluation, Outcomes, and Quality. (3)

Prerequisite(s): Enrollment in the Ph.D. in Health Services Research or Ph.D. in Public Health Sciences programs, or permission of instructor. Corequisite(s): HLTH 8270 or permission of instructor. Introductory course in evaluation research in healthcare settings. Emphasis is on conceptual, methodological, organizational, political, and ethical problems in evaluating

programs. Tasks of identifying quality and outcome indicators, choosing methods, assessing feasibility, assuring quality data, addressing population and program diversity, project management, and incorporating context into reports of findings are also examined.

HSRD 8262. Large Data Sets and Health Services

Research. (3) Prerequisite(s): HLTH 8270 and enrollment in the Ph.D. in Health Services Research program or Ph.D. in Public Health Science programs, or permission of instructor. Addresses the evaluation of healthcare quality and outcome measures through secondary data analysis of large health services data sets. Methodological issues and solutions related to secondary analysis are discussed. Statistical techniques and approaches commonly used in health services research are explored, including adjustment for confounding/endogeneity, missing data, transformations of data, risk adjustment, and time-fixed and time-dependent study designs.

HSRD 8263. Advanced Data Analysis for Health Services

Research. (3) Prerequisite(s): Enrollment in the Ph.D. in Health Services Research program or permission of the instructor. Provides applied skills that enable students to efficiently conduct advanced health services research with complex and multiple health-related databases.

HSRD 8600. Seminar in Health Services Research. (1)

Prerequisite(s): Enrollment in the Ph.D. in Health Services Research or Ph.D. in Public Health Sciences programs, or permission of instructor. This seminar style forum exposes students to a variety of health services research applications through presentation and critique of original research. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit up to four times.*

HSRD 8604. Seminar in Health Outcomes. (1)

Prerequisite(s): Enrollment in the Ph.D. in Health Services Research or Ph.D. in Public Health Sciences programs, or permission of instructor. A review of current research documenting health outcomes and an examination of research designs and methods sensitive to issues in health research. Study includes work from a variety of disciplinary perspectives. *Graded on a Pass/Unsatisfactory basis.*

HSRD 8605. Seminar in Grant Proposal Writing. (1)

Prerequisite(s): Enrollment in Ph.D. in Health Services Research or Ph.D. in Public Health Sciences programs, or permission of instructor. Pre- or Corequisite(s): HSRD 8262. An overview of the grant writing process, including types of funding organizations/programs and grant mechanisms. Students gain skills in writing an effective research proposal and learn about the peer review process and scoring of grants. *Graded on a Pass/Unsatisfactory basis.*

HSRD 8612. Seminar in Grant Proposal Writing. (3)

Prerequisite(s): Enrollment in the Ph.D. in Health Services Research program or permission of the instructor. Seminar to develop a grant proposal using existing funding mechanisms from governmental or private funding agencies. This course uses a step-wise approach to writing all major sections of a grant proposal. Proposal development familiarizes students with governmental guidelines, grant submissions and the peer review process.

HSRD 8800. Independent Study in Health Services

Research. (1 to 6) Prerequisite(s): Full graduate standing in the Ph.D. in Health Services Research program or permission of the instructor. Guided individual study in topics or issues related to health services research arranged with a faculty advisor. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

HSRD 8884. Seminar in Research Implementation and Dissemination. (1)

Pre- or Corequisite(s): Passed comprehensive examination and enrollment in Ph.D. in Health Services Research Program. Seminar on implementation of a funded research project. The infrastructure for successful implementation and reporting is discussed with specific examples. Pitfalls in technology, communication, natural history of a study and budgeting are also discussed. Case studies based on studies by faculty are used to illustrate the range of approaches to the research process. Students develop an application to present and a manuscript for publication. *Graded on a Pass/Unsatisfactory basis.*

HSRD 8901. Dissertation Research. (3, 6, or 9)

Prerequisite(s): Passage of qualifying examination and approval of the Dissertation Chair. Under the direction of a dissertation chair and committee, students are expected to design and execute an original research study. This study should address a significant problem or issue related to health services research. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Interdisciplinary Studies (IDST)

IDST 6000. Topics in Interdisciplinary Studies. (3) Selected topics approached from interdisciplinary perspectives in the liberal arts. *May be repeated for credit with change of topic.* Examples include interrelated courses forming program emphases on Language and Culture and on Religious Ideas in Physical Forms.

IDST 6101. The Interdisciplinary Research Tradition. (3) An interdisciplinary course focused on a relevant liberal studies topic in the humanities or social sciences. Students learn to

critically read across disciplines and to understand the research methods that are covered in liberal studies.

IDST 6102. Writing and Thinking Across the Disciplines. (3)

Explores one research topic important across a wide variety of disciplines, allowing students to expand their writing and theorizing skills about a personal research topic of interest. Students are challenged to evaluate and expand their research problem (and others) from a variety of conceptual frameworks. These activities are designed to make students think about their research from different perspectives and thereby increase critical and creative research skills. The course also engages in activities to improve both written and oral communication about their research. Students write and present a literature review on their topic as the culminating graded activity. *May be repeated for credit with permission of the Graduate Program Director.*

IDST 6600. Liberal Studies Capstone Seminar. (3) An integration of the coursework previously taken. Students complete a substantial Capstone Project, working with their Capstone Project Director. As the culmination of this course, students defend their project at an oral defense with the Director and two additional faculty committee members. This course is to be completed in the student's final semester of study.

IDST 6890. Directed Reading/Research. (1 to 3)

Prerequisite(s): Prior written permission of instructor and MALS Director. Graduate students meet individually or in small groups with the instructor and will be assigned readings and/or research on an interdisciplinary theme. Attendance at the lectures is a course requirement. *May be repeated for credit with permission of the IDST director.*

Infrastructure and Environmental Systems (INES)

INES 8090. Topics in Infrastructure and Environmental Systems. (3) Selected topics in civil and environmental engineering, earth sciences, engineering management, biology, chemistry, economics, or public policy. May be cross-listed with advanced graduate courses offered by respective departments. *May be repeated for credit.*

INES 8101. Environmental Systems. (3) Prerequisite(s): Admission to Ph.D. in Infrastructure and Environmental Systems program. Examines the principles of energy and mass transport as applied to the atmosphere, hydrosphere, lithosphere and the Earth's biogeochemical systems and how these impact human activities and infrastructure. Emerging environmental issues and technologies in the

areas of environmental impact due to human activities and natural disasters, and environmental sustainability including industrial ecology, waste minimization and recycling, will also be examined.

INES 8102. Infrastructure Systems. (3) Prerequisite(s):

Admission to Ph.D. in Infrastructure and Environmental Systems program. Overview of urban infrastructural development. Sustainable design features for facilities, including municipal, transit, industrial, agricultural, telecommunications, and waste management. Impact of infrastructure development on environmental management, including storm water quality and quantity, soil and channel erosion, urban air quality, sprawl, and waste production, treatment, and storage.

INES 8104. Advanced Infrastructure Systems. (3)

Prerequisite(s): Admission to Ph.D. in Infrastructure and Environmental Systems program. Study of the inter-relationship between urban infrastructure systems and the natural environment. Concepts pertaining to sustainability, resilience, climate change and adaptation, environmental quality, smart technology, asset management, decision support, economics and policy are reviewed and tailored to research on contemporary issues and emerging technologies. Students are expected to apply the principles and fundamentals in their specific fields of sciences and engineering.

INES 8113. Case Study. (1 to 3) Prerequisite(s): INES 8101 and INES 8102. Students work together on interdisciplinary teams to study relevant environmental and infrastructure problems presented through case studies. The intent of the course is to directly involve the students in ongoing urban community projects. *May be repeated for credit.*

INES 8120. Numerical Modeling of the Earth System. (3)

Cross-listed Course(s): ESCI 6120. Focuses on fundamental principles and applications of numerical modeling in simulating components of the Earth system, including the atmosphere, land, and water. Philosophical considerations of why and how numerical models and model output are used in the Earth sciences are discussed. Also delves into the technical details of constructing a model, including finite differencing, boundary conditions, and parameterizations, and how these choices influence model output.

INES 8130. Teaching and Learning in the Geosciences. (3)

Cross-listed Course(s): ESCI 6130, GEOG 6130, GEOG 8130. Interactive, discussion-based course exploring effective pedagogy in the geosciences, applicable to many geoscience-related disciplines including atmospheric, ecological, oceanic, geologic, and geographic sciences. Students will explore what makes learning in the geosciences unique, teaching methods that enhance student learning, and how to create effective learning

environments. Other topics include putting together lesson plans, assessing student work, and conducting pedagogical research.

INES 8201. Environmental and Ecological Economics. (3)

Prerequisite(s): permission of instructor. Students explore the ways in which ecosystem services are measured, valued, and monetized by the society. The course is divided into three lecture modules: (a) environmental economics, (b) risk analysis and management, and (c) ecosystem services and valuation. It is appropriate for advanced graduate students with background in engineering, environmental sciences, business, and public policy.

INES 8202. Renewable Energy. (3) Restriction(s): Permission of instructor. Study of technological and system advances in conventional and renewable energies, including system integration, storage, economics, policy, and environmental and health impacts. Emphasis is given to application of renewable energy for the transportation and electric power industries. Students are expected to complete a project or research paper on renewable energy assessment and implementation.

INES 8222. Quaternary Paleoenvironmental Sciences. (3) Cross-listed Course(s): ESCI 6222, GEOG 6222, and GEOG 8222. A multi-disciplinary course which surveys methods used to reconstruct past climates, past environments and past landscapes during the Quaternary period. Changes in past environmental conditions are discussed in light of present and future landscape predictions emphasizing both natural and human causes. Focuses on biotic and abiotic material from terrestrial and marine sediment cores, ice cores, and other proxies for past environments and past climates.

INES 8227. Ecosystem Restoration. (3) Cross-listed Course(s): ESCI 6227, GEOG 6227, and GEOG 8227. Ecosystem restoration has long been used as a method to return the natural structure and function to degraded ecosystems. This course examines the theory and methods used in restoration with a focus on both terrestrial and freshwater ecosystems. Focuses on the science and policy of ecosystem restoration and uses examples from ecosystems around the world.

INES 8229. Geochemical Tracers and Hydrologic Applications. (3) Cross-listed Course(s): ESCI 6229, GEOG 6229, and GEOG 8229. Examines environmental tracers in surface and subsurface hydrology (streams, lakes, and groundwater) using an applied approach. Tracer techniques include geochemical element fingerprinting, stable isotopes, and residence time estimation.

INES 8690. Seminar. (1) Prerequisite(s): Admission to Ph.D. in Infrastructure and Environmental Systems program.

Students are required to actively participate in program seminars delivered by student researchers, faculty and invited speakers. These seminars are advertised to the campus and professional communities. Participation in these seminars count for a total of 3 credits (1 credit for each semester). Prior to graduation, each student makes at least one seminar presentation and provides at least one formal critique of a presentation. *May be repeated for credit.*

INES 8890. Doctoral Independent Study and Project. (1 to 9) Individual investigation and exposition of results. *May be repeated for credit.*

INES 8998. Doctoral Research. (1 to 9) Prerequisite(s): INES 8999. Students continue individual investigations culminating in research and the preparation of scholarly publications upon completing the 18 credit hour maximum of INES 8999. Credit hours earned will not be counted toward curriculum requirements. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

INES 8999. Doctoral Dissertation Research. (1 to 9) Students initiate and conduct individual investigations culminating in the preparation and presentation of a doctoral dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit up to 18 credit hours.*

Business Information Systems (INFO)

INFO 8100. Information Systems Research Methodologies. (3) Prerequisite(s): Graduate standing or permission of the instructor. A study of statistical and research methods used in information systems research.

INFO 8120. Advanced Research Methodologies. (3) Prerequisite(s): INFO 8100 or permission of department. A study of advanced research methods used in business administration and management information systems research.

INFO 8201. Data and Knowledge Management in Business. (3) Prerequisite(s): MBAD 5121 or permission of department and admission to the Ph.D. in Computing and Information Systems Program. An overview of the business approach to identifying, modeling, retrieving, sharing, and evaluating an enterprise's data and knowledge assets. Covers the organizational, technological and management perspectives.

INFO 8202. Business Information Systems: Analysis, Design, and Management. (3) Prerequisite(s): MBAD 5121 or

permission of department. Examination of managerial issues associated with the study of business processes and the development of supporting information systems. Emphasis on the application of appropriate methodologies, techniques, and tools to analyze, design, and implement business information systems. Study of relevant IS project management and quality assurance techniques.

INFO 8203. Information Systems Economics, Strategy and Policy. (3) Prerequisite(s): MBAD 5121 or permission of department and admission to the Ph.D. in Computing and Information Systems Program. Examines a collection of topics that deal with the strategic use of information systems (IS). These topics include Business Value of IS, Network Economics, use of IS for competitive advantage, IS Planning and policy setting, IS evaluation, selection and sourcing.

INFO 8204. Business Data Communications. (3) Prerequisite(s): MBAD 5121 or permission of department. Examination of the information communication requirements of business environments, the fundamentals of communication technology, and the application of the technology for solving business problems. Emphasis on understanding communication technologies to assess needs, plan for the introduction of hardware and software, and manage these communication systems.

INFO 8700. Advanced Topics in MIS. (3) Prerequisite(s): Permission of department. Topics in MIS selected to supplement the regular course offerings. *May be repeated for credit with change of topic.*

INFO 8800. Information Systems Research Seminar. (3) Prerequisite(s): INFO 8100 or permission of department. A study of current research areas in MIS.

INFO 8900. Directed Individual Study in Business Information Systems. (3) Prerequisite(s): Permission of department and member of the doctoral faculty who would direct the study. Directed individual study and in-depth analysis of a special area of MIS. The course may be used to satisfy up to six credit hours of graduate credit requirements in the Ph.D. in Computing and Information Systems degree program. *May be repeated for credit with different area of study.*

Interpreting (INTE)

INTE 5050. Topics and Practicum in Interpreting. (3) Selected topics in Interpreting and Interpreting Studies. May include practice in interpreting a variety of languages. *May be repeated for credit with change of topic.*

INTE 6050. Topics in Interpreting Studies. (3) Selected topics in field of interest related to various theoretical and

practical aspects of interpreting and interpreting studies. *May be repeated for credit with change of topic.*

INTE 6172. Spanish-English Legal Interpreting. (3) Explores the sociolinguistic, legal, ethical, and pragmatic dimensions of legal interpreting. Also reviews legal terminology in the Spanish-English language combination and develops skills in sight translation, consecutive interpreting, and simultaneous interpreting in a variety of legal settings. *May be repeated for credit with change of topic.*

INTE 6174. Spanish-English Medical Interpreting. (3) Explores the sociolinguistic, legal, ethical, and pragmatic dimensions of medical interpreting, as well as healthcare literacy, cross-cultural communication, and intercultural competency. Also reviews medical terminology in the Spanish-English language combination and develops skills in sight translation, consecutive interpreting, and simultaneous interpreting in a variety of medical settings. *May be repeated for credit with change of topic.*

INTE 6176. Spanish-English Community Interpreting. (3) Explores the sociolinguistic, legal, ethical, and pragmatic dimensions of community interpreting in a variety of settings, such as educational and social work. Also reviews relevant terminology in the Spanish-English language combination and develops skills in sight translation, consecutive interpreting, and simultaneous interpreting in these settings. *May be repeated for credit with change of topic.*

INTE 6601. History, Theory, and Method of Interpreting. (3) Explores representative topics, movements, and texts in the history, theory, and method of interpreting, traces the development of the discipline, and introduces the practice of interpreting in three different modes: sight translation, consecutive, and simultaneous. *May be repeated for credit with change of topic.*

Computer Science (ITCS)

ITCS 5010. Topics in Computer Science. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Topics in computer science selected to supplement the regular course offerings. A student may register for multiple sections of the course with different topics in the same semester or in different semesters.

ITCS 5102. Survey of Programming Languages. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Study of the concepts underlying various computer languages, and comparing and evaluating various language features. History and development of various languages, such as FORTRAN, ALGOL, PASCAL, MODULA-2, C, C++, Ada, Lisp, Smalltalk, Prolog; evaluation and comparison of various algorithms and

language suitability. Selection of languages for problems/environments. Overview of various languages.

ITCS 5111. Introduction to Natural Language Processing. (3)

The practical methods and techniques of natural language processing and text mining. These techniques, mainly the techniques of syntactic and semantic processing, are illustrated with specific tasks (such as: Information Extraction, Dialogue Systems, Information Retrieval, etc.). Most programming assignments are for the laptop. Selected ones could be done in the cloud (e.g., using AlchemyAPI and/or IBM Bluemix). Students are expected to bring their laptops to each class.

ITCS 5121. Information Visualization. (3) Cross-listed Course(s): HCIP 5121. Prerequisite(s): CCI graduate standing or permission of instructor. Information visualization concepts, theories, design principles, popular techniques, evaluation methods, and information visualization applications.

ITCS 5122. Visual Analytics. (3) Prerequisite(s): Full CCI graduate standing and STAT 1220, STAT 1221, STAT 1222, STAT 2122, STAT 2223, or approval of the instructor. Introduces the new field of visual analytics, which integrates interactive analytical methods and visualization. Topics include: critical thinking, visual reasoning, perception/cognition, statistical and other analysis techniques, principles of interaction, and applications.

ITCS 5123. Visualization and Visual Communication. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Understanding the relatively technical field of visualization from the point of view of visual communication, this course draws connections with photography, design, illustration, aesthetics, and art. Both technical and theoretical aspects of the various fields are covered, and the connections between them are investigated.

ITCS 5141. Computer Organization and Architecture. (3) Prerequisite(s): CCI graduate standing and undergraduate computer architecture course, or permission of instructor. Cross-listed course(s): ITCS 4141. Exploration of how software executes within a computer system, from operating system to hardware components, encompassing application for AI, real-time systems, such as robotics, and scientific computing. The course delves into the capability and performance aspects of the Central Processing Unit (CPU), Graphic Processing Unit (GPU), and computer memory system and interconnect architecture, along with how the operating systems manage them. The course includes a project focusing on developing or evaluating applications from system and architecture perspectives.

ITCS 5150. Mobile Robotics. (3) Cross-listed Course(s): ITCS 4150. An introduction to basic concepts and techniques

used in mobile robotics. Topics include: mobile robot hardware, sensors and sensor data processing, planning and control, robot architectures, localization and mapping, path planning, and mobile robot applications.

ITCS 5153. Applied Artificial Intelligence. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Introduction to fundamental concepts of Artificial Intelligence (AI), while focusing on the practical application of AI algorithms and technologies to the solution of real-world problems. Students work with state-of-the-art libraries and frameworks, such as OpenAI, TensorFlow, PyTorch, Azure AI, and OpenCV. Topics include: pathfinding, adversarial search, deep reinforcement learning, using neural networks to solve classification problems, speech recognition, language translation, object identification, and image manipulation.

ITCS 5154. Applied Machine Learning. (3) Explores the components of machine learning prediction functions for classification and regression with an emphasis on practical applications. Topics include: fundamental concepts, such as training, validation, overfitting, and error rates. Also introduces commonly-used machine learning algorithms, such as decision trees, naive Bayes, neural networks and random forests. Covers the complete machine learning pipeline, including data collection, feature creation, algorithms, and evaluation.

ITCS 5161. Intellectual Property Aspects of Computing. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Explores the broad field of intellectual property and the many aspects related to computing. Topics include: software copyrights, software patents, trademarks and service marks, employment contracts, non-compete agreements, software licenses, software development contracts, preservation of digital evidence, protection of trade secrets, cyberspace law and the use of mediation in IP disputes.

ITCS 5180. Mobile Application Development. (3) Cross-listed Course(s): ITIS 5180. Prerequisite(s): CCI graduate standing or permission of instructor. Mobile platforms are at the center of attention of users and organizations nowadays. Most organizations and businesses are rapidly migrating toward the cloud and need to provide a fast and easy mechanism for users to stay connected to their services. Mobile applications are the top trend nowadays given the high variety of new mobile devices and platforms such as Apple's iOS and Google's Android. In this course, students are introduced to the foundations of mobile development and its unique requirements and constraints. Students design and build a variety of mobile applications with a hands-on and project-based approach.

ITCS 5182. Introduction to High Performance Computing. (3) Cross-listed Course(s): ITCS 4182. Fundamentals of

parallel computer systems; throughput computing; memory hierarchies; computation/communication overlapping; mapping high level programs to low level components; leveraging accelerators; performance optimization; performance evaluation.

ITCS 5230. Introduction to Game Design and Development. (3)

Prerequisite(s): CCI graduate standing or permission of instructor. Basic concepts and techniques for electronic game design and development. Topics include: game history and genres, game design teams and processes, what makes a game fun, level and model design, game scripting and programming including computer graphics and animation, artificial intelligence, industry issues, and gender and games.

ITCS 5231. Advanced Game Design and Development. (3)

Prerequisite(s): ITCS 5230. Advanced concepts and techniques for electronic game design and development. A project-centered course where students explore complex gameplay and interactivity. Explores topics from the introductory course in more depth, such as: applying software engineering techniques to developing games, advanced game programming and scripting, networking, graphics, physics, audio, game data structures and algorithms, and artificial intelligence.

ITCS 5232. Game Design and Development Studio. (3)

Prerequisite(s): ITCS 5231 and permission of instructor. Application of advanced concepts and techniques for electronic game design and development. Teams use engineering techniques to incorporate game programming and scripting, networking, graphics, physics, audio, game data structures and algorithms, and artificial intelligence into an electronic game. Individuals develop a complete portfolio of prior work and the course project.

ITCS 5235. Game Engine Construction. (3)

Prerequisite(s): ITCS 4120, ITCS 6120, or permission of instructor. Introduction to principles and techniques behind modern computer and console game engines. Graphics Rendering Pipeline (transformations, lighting, shading); 2D/3D Texture Mapping; Image Based Rendering; Spatial Data Structures and Acceleration Algorithms; Level of Detail; Collision Detection, Culling and Intersection Methods; Vertex/Pixel Shaders; Pipeline Optimization; Rendering Hardware.

ITCS 5236. Artificial Intelligence for Computer Games. (3)

Prerequisite(s): ITCS 6150 or permission of instructor. Application of advanced concepts and techniques in artificial intelligence for electronic game design and development. An investigation of the artificial intelligence techniques necessary for an agent to act, or appear to act, intelligently in interactive virtual worlds. Topics include: uncertainty reasoning, machine learning, perception, knowledge representation, search, and planning. Emphasis will be on implementation and experimentation with the

goal of building robust intelligent agents in interactive entertainment domains. Elements of multi-agent collaboration and the use of cognitive architectures in interactive computer games will also be discussed.

ITCS 5356. Introduction to Machine Learning. (3) Machine learning has been successfully applied to many different areas such as autonomous control of cars and robots, natural language processing, image recognition, health science, biology, and data mining. This course introduces fundamental concepts and methods to learn from data for computational data analysis, including pattern recognition, prediction, and visualization. For this, this course covers supervised learning, unsupervised learning, and reinforcement learning, including linear regression, perceptron, k-Nearest Neighbor, logistic regression, clustering, dimensionality reduction, reinforcement learning, and neural networks based on the foundations of linear algebra, probability theory, and optimization.

ITCS 6010. Topics in Computer Science. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Topics in computer science selected to supplement the regular course offerings. Students may register for multiple sections of the course with different topics in the same semester or in different semesters. *May be repeated for credit with change of topic.*

ITCS 6040. Topics in Data Science. (3) Topics in data science selected to supplement the regular course offerings. Students may register for multiple sections of the course with different topics in the same semester or in different semesters. *May be repeated with change of topic.*

ITCS 6050. Topics in Artificial Intelligence. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Topics in Artificial Intelligence selected to supplement the regular course offerings. *May be repeated for credit with change of topic.*

ITCS 6100. Big Data Analytics for Competitive Advantage. (3)

Cross-listed Course(s): DSBA 6100 and HCIP 6103. Prerequisite(s): CCI graduate standing or permission of instructor. An introduction to the use of big data as a strategic resource. A focus is placed on integrating the knowledge of analytics tools with an understanding of how companies leverage data analytics to gain strategic advantage. A case approach is used to emphasize hands-on learning and a real-world view of big data analytics.

ITCS 6101. Natural Language Processing. (3)

Prerequisite(s): ITCS 5356 or permission by instructor. Natural Language Processing (NLP) is a branch of Artificial Intelligence (AI) concerned with developing computer systems that analyze or generate natural language. This course introduces the main concepts and techniques underlying

widely used NLP applications such as text classification, machine translation, question answering, or conversational AI. Topics include: Linguistic analysis tasks, including tokenization, word representations, syntactic and semantic parsing, and coreference resolution; string processing and regular expressions; machine learning models for text processing, including recurrent neural networks and Transformer; language models (LM); topic models; ethical considerations and limitations of NLP models.

ITCS 6112. Software System Design and Implementation.

(3) Cross-listed Course(s): HCIP 6112 and ITIS 6112.

Prerequisite(s): CCI graduate standing or permission of instructor. Introduction to the techniques involved in the planning and implementation of large software systems. Emphasis on human interface aspects of systems. Planning software projects; software design process; top-down design; modular and structured design; management of software projects; testing of software; software documentation; choosing a language for a software system.

ITCS 6114. Algorithms and Data Structures. (3) Cross-listed Course(s): ITCS 8114. Prerequisite(s): CCI graduate standing or permission of instructor. Analyzing algorithms and problems; data abstraction and data structures; recursion and induction; time and space complexities; searching and sorting; search trees and tries; hashing; heaps; dynamic programming; graph algorithms; string matching; NP-complete problems.

ITCS 6115. Advanced Algorithms. (3) Prerequisite(s): ITCS 6114. Cross-listed Course(s): ITCS 8115. Randomized Algorithms; Parallel/Distributed algorithms; Approximation Algorithms; Combinatorial Optimization and Graph Algorithms; Algorithms in Non-Classical Models.

ITCS 6120. Computer Graphics. (3) Cross-listed Course(s): ITCS 8120. Prerequisite(s): CCI graduate standing or permission of instructor. Introduction to the design and implementation of interactive graphics systems. Raster and vector display systems, I/O devices; graphics primitives and their attributes; raster algorithms and clipping; 2D/3D geometric transformations; 3D viewing and projections; hierarchical and procedural models; surface representation; color and lighting models; rendering algorithms; global illumination and texture mapping.

ITCS 6116. Optimization for Machine Learning. (3) Cross-listed Course(s): ITCS 8116, ECGR 6126, ECGR 8126. Optimization formulations and algorithms play a central role in modern data science, machine learning and artificial intelligence. This graduate course provides an introduction to the basics of continuous optimization, with an emphasis on scalable techniques used in data science and machine learning applications. Students study basic complexity properties of relevant optimization algorithms and their

relationship with topics in machine learning such as (generalized) principal component analysis, sparse and logistic regression, regularized empirical risk minimization and the training of deep neural networks. The course also focuses on practical implementations of these algorithms and the usage of optimization modeling software which leverages state-of-the-art optimization solvers.

ITCS 6121. Data and Information Visualization. (3)

Prerequisite(s): ITCS 2214 or equivalent; CCI graduate standing and undergraduate course in data structures, or permission of instructor. Cross-listed Course(s): ITCS 8121. Topics in scientific and information visualization, including data and visualization foundations; human vision and cognition; categorical, quantitative and time varying data; spatial visualization; graph/tree visualization; visualization evaluation and design; visualization case studies.

ITCS 6124. Illustrative Visualization. (3) Cross-listed Course(s): ITCS 8124. Prerequisite(s): CCI graduate standing or permission of the instructor. The state-of-the-art of illustrative visualization techniques, which transform large-scale, complex datasets to succinct, non-photorealistic visualization styles and at the same time preserve important data features. Topics include: 2D/3D stippling, interactive line drawings, animated visualization, non-photorealistic rendering, design, and evaluation of illustrative visualization approaches.

ITCS 6125. Virtual and Augmented Reality. (3) Cross-listed Course(s): ITCS 8125. Prerequisite(s): CCI graduate standing or permission of instructor; previous programming experience in 3D computer graphics is recommended. The design and implementation of Virtual and Augmented Reality systems and applications. Topics include: position tracking, design of head-tracked and head-mounted displays, stereoscopic display, 3D user interface design, presence measurement, and applications.

ITCS 6132. Modeling and Analysis of Communication Networks. (3) Prerequisite(s): A course in communication networks or permission of instructor. The objective is to develop an understanding of modeling and analysis techniques for communication systems and networks. Enable the student to understand how to comparatively analyze the cost and performance impact of network architecture and protocol design decisions. Modeling techniques for analytical analysis, simulation based analysis, and measurement based analysis will be presented. Topics include: validation/verification of models, workload characterization, metric selection, presentation and interpretation of results. A semester long analysis project will be undertaken.

ITCS 6134. Digital Image Processing. (3) Cross-listed Course(s): ECGR 6118 and ECGR 8118. Prerequisite(s): CCI graduate standing or permission of instructor. Image

perception; image types/applications; image restoration and enhancement; edge/boundary detection; image transformation; image segmentation; statistical and syntactical pattern recognition; image information measures and compression.

ITCS 6141. Computer System and Architecture: Performance and Implementation. (3) Cross-listed Course(s): ITCS 8141. Examines the performance aspects of advanced computer systems and parallel architecture, design choices of computer system and architecture implementation, and use of quantitative performance models to evaluate each choice. The course includes a project for developing or evaluating a selected computer system architecture. Topics include: parallel computer architecture of Central Processing Unit (CPU) and Graphic Processing Unit (GPU); domain specific architectures; CPU/GPU memory hierarchy and caching architecture; coherence of memory systems; discrete memory system and offloading computation of accelerator architecture; performance models and metrics for computation; techniques and tools for performance analysis and optimization.

ITCS 6144. Operating Systems Design. (3) Prerequisite(s): ITCS 6114 or permission of instructor. Introduction to features of a large-scale operating system with emphasis on resource-sharing environments. Computer system organization; resource management; multiprogramming; multi-processing; file systems; virtual machine concepts; protection and efficiency.

ITCS 6145. Parallel Computing. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Cross-listed Course(s): ITCS 8145. Introduction to a wide range of applications, including database systems, web browsers, video games and Artificial Intelligence systems to analyze and improve the performance of applications and analyze parallel codes and systems to predict their performance and bottlenecks. Topics include: Programming multi-core systems and GPUs, theoretical models of parallel computing, performance analysis, parallel algorithms, and real-world applications of parallel computing.

ITCS 6150. Artificial Intelligence. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Examines the basic design principles, concepts and algorithms that can be used to design artificially intelligent systems. Topics include: Agent models, search algorithms; game playing; constraint satisfaction problems; Markov decision processes & reinforcement learning; supervised learning; knowledge representation; logic; Bayesian & decision networks; sampling; advanced topics as time permits. Students are expected to have familiarity with high-level, general-purpose programming language such as Python; Fundamental concepts from probability theory; Basic data

structures and algorithms such as queues, trees, graphs, hash tables, and sorting.

ITCS 6151. Intelligent Robotics. (3) Prerequisite(s): CCI graduate standing and undergraduate course in linear algebra, or permission of instructor. General introduction to spatial descriptions and transformations, and manipulator position and motion. More study on robot planning, programming, sensing, vision, and CAD/CAM.

ITCS 6152. Robot Motion Planning. (3) Prerequisite(s): ITCS 6114 or permission of instructor. Introduction to algorithmic techniques for robot motion planning. Topics include: configuration space representations, roadmap methods, cell decomposition methods, potential field techniques, randomized path planning, collision detection, nonholonomic motion planning, multiple robot coordination, and manipulation planning. These techniques are motivated by applications of motion planning to mobile robots and robot manipulators, assembly planning, computer aided design, computer graphics, and bioinformatics.

ITCS 6155. Knowledge-Based Systems. (3) Cross-listed Course(s): DSBA 6155. Prerequisite(s): ITCS 6162 or permission of instructor. Knowledge systems; knowledge discovery; association rules; action rules, hierarchical classifiers, cascade classifiers, query languages and their semantics; cooperative and collaborative systems; ontology and metadata; flexible query answering; chase algorithms and data sanitization methods; decision support systems in medicine; and automatic indexing of music.

ITCS 6156. Machine Learning. (3) Prerequisite(s): ITCS 5356 or permission of instructor. Introduction of advanced concepts, techniques, and algorithms underlying the theory and practice of machine learning (ML) and deep learning. The description of the formal properties of the algorithms will be supplemented with motivating applications in areas such as natural language processing, computer vision, education, or medicine. Topics include: bias-variance trade-off; ensemble methods; autoencoders, convolutional neural networks, (gated) recurrent neural networks and attention; Transformer and language models; probabilistic graphical models and structured outputs; energy-based models, GANs, VAEs, and diffusion; time series forecasting; explainability and probing of ML models; bias in ML models; theoretical underpinnings of deep learning; deep reinforcement learning (RL).

ITCS 6157. Visual Databases. (3) Prerequisite(s): ITCS 6160, ITIS 6120, or permission of instructor. Topics include: representation of visual content, querying visual databases, content-based interactive browsing and navigation, system architecture, similarity models, indexing visual databases, data models and knowledge structures, image retrieval by similarity, and video retrieval by content.

ITCS 6160. Database Systems. (3) Prerequisite(s): CCI graduate standing or permission of instructor. The modeling, programming, and implementation of database systems. Focuses on relational database systems, but may also address non-relational databases or other advanced topics. Topics include: (1) modeling: conceptual data modeling, ER diagram, relational data model, schema design and refinement; (2) programming: relational algebra and calculus, SQL, constraints, triggers, views; (3) implementation: data storage, indexing, query execution, query optimization, and transaction management; and (4) advanced: semi-structured data model, XML, and other emerging topics.

ITCS 6161. Advanced Topics in Database Systems. (3) Prerequisite(s): ITCS 6160, ITIS 6120, or permission of instructor. Continuation of ITCS 6160. Topics include: deductive databases; semantic query processing; intelligent and cooperative query languages; distributed databases; active databases; heterogeneous databases, multimedia databases; data and knowledge interchange; multidatabase systems; very large databases.

ITCS 6162. Knowledge Discovery in Databases. (3) Cross-listed Course(s): DSBA 6162, HCIP 6162, and ITIS 6162. Exploration of knowledge discovery and data mining algorithms for data analysis, with an emphasis on techniques suitable for large datasets. Topics include: Data Operations (fusion, reduction, sanitization, balancing), Association/Representative Rules, Clustering, High Dimensional & Distributed Data Mining, Dimensionality Reduction, Link Analysis, and Actionability (Action and Meta-Action Rules). The curriculum also spans a diverse range of data mining areas such as Mining Data Streams, Web Mining, Web Advertising, Knowledge-Based Recommendation Systems, and Personalization. Throughout the course, a special focus will be placed on practical applications, showcasing diverse examples from fields like healthcare and business.

ITCS 6163. Data Warehousing. (3) Cross-listed Course(s): ITIS 6163. Prerequisite(s): ITCS 6160 or ITIS 6120. Topics include: use of data in discovery of knowledge and decision making; the limitations of relational databases and SQL queries; the warehouse data models: multidimensional, star, snowflake; architecture of a data warehouse and the process of warehouse construction; data consolidation from various sources; optimization; techniques for data transformation and knowledge extraction; relations with enterprise modeling.

ITCS 6165. Coding and Information Theory. (3) Prerequisite(s): knowledge of probability theory or permission of instructor. Cross-listed Course(s): ECGR 6165. Information theory; coding theory; Shannon's theorem; Markov process; channel capacity; data transmission

codes; error correcting codes; data compression; data encryption.

ITCS 6166. Computer Communications and Networks. (3) Prerequisite(s): CCI graduate standing or permission of instructor. Introduction to the fundamental principles and cutting-edge technologies that underpin computer networks, including OSI layered architectures, application layer protocols, flow and congestion control protocols, routing protocols, MAC layer protocols, software-defined networking (SDN), AI-infused protocols, and the emerging applications of computer networks in the smart future, such as AI-as-a-Service, smart cities, transportation, retail, healthcare, and manufacturing. Topics Include: Basics of Internet, Layer Protocols, Next-generation Wireless Networking, Software-defined Networking, and AI-enabled/AI-native Networking.

ITCS 6167. Advanced Networking Protocols. (3) Prerequisite(s): ITCS 6166 or ITCS 6168. Advanced networking concepts and protocols related to the design, implementation, integration, and management of networking and communication systems. Topics include: topology control protocols, ad hoc routing protocols, power management protocols, distributed data processing protocols for various networking systems (Internet, wireless mesh networks, ad hoc networks, sensor networks, peer-to-peer networks).

ITCS 6168. Wireless Communication Networks. (3) Prerequisite(s): CCI graduate standing in CS, SIS, ECE, or Optics and a prior course in networking, or permission of instructor. An overview of mobile systems and wireless networking technologies. Emphasis on resource management, routing and quality of service at the MAC and networking layers for mobile systems. Students undertake a semester long research project to survey the research literature and identify specific challenges for cellular telecommunications, wireless LANS, ad hoc networks, mesh networks or sensor networks.

ITCS 6169. Computer Vision. (3) Prerequisite(s): ITCS 3156 or ITCS 5154 or permission of instructor; CCI graduate standing and undergraduate course in linear algebra, or permission of instructor. Cross-listed Course(s): ITCS 8169. Computer Vision involves teaching machines to interpret and understand the visual world, namely images and videos. In this course, students will learn advanced computer vision algorithms applied in real-world scenarios. As a project-based curriculum, it offers hands-on experience by enabling students to implement industry-relevant computer vision algorithms. Additionally, the course will explore state-of-the-art approaches including CNNs, Vision Transformers, Diffusion Models, and self-supervised learning.

ITCS 6190. Cloud Computing for Data Analysis. (3) Cross-listed Course(s): ITCS 8190. Prerequisite(s): ITCS 6114 or permission of instructor; familiarity with Java, Unix, Data Structures and Algorithms, Linear Algebra, and Probability and Statistics; good programming skills and a solid mathematical background. Introduction to the basic principles of cloud computing for data-intensive applications. Focuses on parallel computing using Google's MapReduce paradigm on Linux clusters, and algorithms for large-scale data analysis applications in web search, information retrieval, computational advertising, and business and scientific data analysis. Students read and present research papers on these topics, and implement programming projects using Hadoop, an open source implementation of Google's MapReduce technology, and related NoSQL technologies for analyzing unstructured data.

ITCS 6216. Introduction to Cognitive Science. (3) Cross-listed Course(s): PSYC 6216 and ITIS 6216. Multiple perspectives on the study of intelligent systems. Broad coverage of such topics as philosophy of mind; human memory processes; reasoning and problem solving; artificial intelligence; language processing (human and machine); neural structures and processes; and vision. Also included is participation in the cognitive science seminar.

TCS 6226. Bioinformatics. (3) Prerequisite(s): CCI graduate standing. Topics include: brief review of molecular biology, proteins, and their classifications, DNA, RNA, and using microarrays and gene chips for sequencing; review of computational techniques for bioinformatics, expectation maximization, Bayesian classifiers, dynamic programming, information theory and entropy analysis, Markov chain models, and neural networks; computational techniques for local and multiple sequence alignment; application of Markov chains in finding genes; using information theory to estimate binding sites, start Codon prediction; RNA secondary structure prediction; computational techniques for protein function prediction; advanced signal processing techniques in feature extraction from protein sequences.

ITCS 6265. Advanced Topics in Data Mining. (3) Prerequisite(s): ITCS 6162 or permission of instructor. Continuation and extension of ITCS 6162. Information visualization in data mining and knowledge discovery, predictive data mining, mining of multimedia sources, mining of unstructured data, distributed data mining, mining of Web data/information, mining complex types of data, mining of biotechnology data, applications, and trends in data mining.

ITCS 6322. Complex Adaptive Systems. (3) Cross-listed Course(s): DSBA 6322, HCIP 6322, ITCS 8322, ITIS 6322, and ITIS 8322. Prerequisite(s): CCI graduate standing or permission of instructor. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors

and, occasionally, distant agents), nonlinear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. Examples of current research efforts are provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity.

ITCS 6345. Modern Data Science Systems. (3) Cross-listed Course(s): DSBA 6345. Prerequisite(s): DSBA 6100 or ITCS 6100. Advanced and recent techniques in data science, and their applications to business problems. Topics include: enterprise search and question answering, machine learning with neural networks, probabilistic and graph algorithms, and topological data analysis. Most assignments are done "in the cloud." The course assumes basic knowledge of data science exemplified by a graduate, undergraduate, or online machine learning course; a natural language processing course; as well as knowledge of elementary linear algebra, calculus, and statistics. Some experience with cloud computing is also expected.

ITCS 6490. Industrial Internship. (3) Prerequisite(s): Completion of 21 hours of graduate coursework. Full- or part-time academic year internship in computer science areas complementary to the concentration area of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's internship program must be approved by the graduate program director. A mid-term report and a final report to be evaluated by the graduate program director are required. Grading is on a Pass/Unsatisfactory basis by the graduate program director in consultation with off-campus supervisor at the internship organization. The credit hours may only count towards the elective requirement. *Cannot be repeated for credit.*

ITCS 6617. Computational Human Behavior Modeling. (3) Cross-listed Course(s): PSYC 6617. Computational human behavior modeling is a research area at the intersection of computer science and social science, including psychology, sociology, communication, and linguistics. Its objective is to advance both fields by combining the power of data analytics and artificial intelligence with the scientific method for studying human data and human

behavior. This course is a research seminar in which students engage with research through a series of readings, understanding concepts in the social sciences about human language, attitudes, and behaviors and understand how these concepts can be formalized into computational models or algorithms.

ITCS 6880. Individual Study. (1 to 3) Prerequisite(s): At least 9 graduate ITCS/ITIS hours and permission of department. With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects. *May be repeated for credit.*

ITCS 6881. Individual Study in AI, Robotics, and Gaming. (1 to 3) Prerequisite(s): At least 9 graduate ITCS/ITIS credit hours and permission of department. With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects in AI, Robotics, and Gaming. *May be repeated for credit.*

ITCS 6882. Individual Study in Data Science. (1 to 3) Prerequisite(s): At least 9 graduate ITCS/ITIS credit hours and permission of department. With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects in Data Science. *May be repeated for credit.*

ITCS 6883. Individual Study in Software, Systems, and Networks. (1 to 3) With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects in Software, Systems, and Networks. *May be repeated for credit.*

ITCS 6991. Computer Science Thesis. (1 to 3) Prerequisite(s): Permission of department. Graduate thesis research. Detailed exploration of an area of computer science chosen for thesis research. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit but no more than six credit hours may be applied to M.S. degree requirements.*

ITCS 8010. Topics in Computer Science. (3) Prerequisite(s): Ph.D. student standing or permission of instructor. Topics in computer science selected to supplement the regular course offerings. A student may register for multiple sections of the course with different topics in the same semester or in different semesters.

ITCS 8050. Topics in Artificial Intelligence. (3) Prerequisite(s): Ph.D. student standing or permission of instructor. Topics in Artificial Intelligence selected to supplement the regular course offerings. *May be repeated for credit with change of topic.*

ITCS 8101. Natural Language Processing. (3) Prerequisite(s): ITCS 5154 or ITCS 6156 or permission of instructor. Natural Language Processing (NLP) is a branch of Artificial Intelligence (AI) concerned with developing computer systems that analyze or generate natural language. This course introduces the main concepts and techniques underlying widely used NLP applications such as text classification, machine translation, question answering, or conversational AI. Topics include: Linguistic analysis, methodologies including tokenization, word representation, syntactic and programming methods, semantic parsing, co-reference resolution, string processing and regular expressions, machine learning models for text processing such as recurrent neural networks and Transformer, language and topic models, ethical considerations and limitations of NLP models.

ITCS 8112. Software Systems Design and Implementation. (3) Cross-listed Course(s): ITIS 8112. Prerequisite(s): Ph.D. student standing or permission of instructor. Introduction to the techniques involved in the planning and implementation of large software systems. Emphasis on human interface aspects of systems. Planning software projects; software design process; top-down design; modular and structured design; management of software projects; testing of software; software documentation; choosing a language for software system.

ITCS 8114. Algorithms and Data Structures. (3) Cross-listed Course(s): ITCS 6114. Prerequisite(s): Ph.D. student standing or permission of instructor. Analyzing algorithms and problems; data abstraction and data structures; recursion and induction; time and space complexities; searching and sorting; search trees and tries; hashing; heaps; dynamic programming; graph algorithms; string matching; NP-complete problems.

ITCS 8115. Advanced Algorithms. (3) Prerequisite(s): ITCS 8114. Cross-listed Course(s): ITCS 6115. Topics include: Randomized Algorithms; Parallel/Distributed Algorithms; Approximation Algorithms; Combinatorial Optimization and Graph Algorithms; and Algorithms in Non-Classical Models.

ITCS 8116. Optimization for Machine Learning. (3) Cross-listed Course(s): ITCS 6116, ECGR 6126, ECGR 8126. Optimization formulations and algorithms play a central role in modern data science, machine learning and artificial intelligence. This graduate course provides an introduction to the basics of continuous optimization, with an emphasis on scalable techniques used in data science and machine

learning applications. Students study basic complexity properties of relevant optimization algorithms and their relationship with topics in machine learning such as (generalized) principal component analysis, sparse and logistic regression, regularized empirical risk minimization and the training of deep neural networks. The course also focuses on practical implementations of these algorithms and the usage of optimization modeling software which leverages state-of-the-art optimization solvers.

ITCS 8120. Computer Graphics. (3) Cross-listed Course(s): ITCS 6120. Prerequisite(s): Ph.D. student standing or permission of instructor. Introduction to the design and implementation of interactive graphics systems. Raster and vector display systems, I/O devices; graphics primitives and their attributes; raster algorithms and clipping; 2D/3D geometric transformations; 3D viewing and projections; hierarchical and procedural models; surface representation; color and lighting models; rendering algorithms; global illumination and texture mapping.

ITCS 8121. Data and Information Visualization. (3) Prerequisite(s): ITCS 2214 or equivalent; CCI graduate standing and undergraduate course in data structures, or permission of instructor. Cross-listed Course(s): ITCS 6121. Topics in scientific and information visualization, including data and visualization foundations; human vision and cognition; categorical, quantitative and time varying data; spatial visualization; graph/tree visualization; visualization evaluation and design; visualization case studies.

ITCS 8124. Illustrative Visualization. (3) Cross-listed Course(s): ITCS 6124. Prerequisite(s): Graduate standing or permission of the instructor. The state-of-the-art of illustrative visualization techniques, which transform large-scale, complex datasets to succinct, non-photorealistic visualization styles and at the same time preserve important data features. Topics include: 2D/3D stippling, interactive line drawings, animated visualization, non-photorealistic rendering, design, and evaluation of illustrative visualization approaches.

ITCS 8125. Virtual and Augmented Reality. (3) Cross-listed Course(s): ITCS 6125. Prerequisite(s): Ph.D. student standing or permission of instructor; previous programming experience in 3D computer graphics is recommended. The design and implementation of Virtual and Augmented Reality systems and applications. Topics include: position tracking, design of head-tracked and head-mounted displays, stereoscopic display, 3D user interface design, presence measurement, and applications.

ITCS 8132. Modeling and Analysis of Communication Networks. (3) Prerequisite(s): A course in communication networks or permission of instructor. Students develop an understanding of modeling and analysis techniques for communication systems and networks. Comparatively

analyze the cost and performance impact of network architecture and protocol design decisions. Modeling techniques for analytical analysis, simulation-based analysis, and measurement-based analysis. Topics include: validation/verification of models, workload characterization, metric selection, presentation and interpretation of results. A semester long analysis project is undertaken.

ITCS 8134. Digital Image Processing. (3) Cross-listed Course(s): ECGR 6118. Prerequisite(s): Ph.D. student standing or permission of instructor. Image perception; image types/applications; image restoration and enhancement; edge/boundary detection; image transformation; image segmentation; statistical and syntactical pattern recognition; image information measures and compression.

ITCS 8141. Computer System and Architecture: Performance and Implementation. (3) Prerequisite(s): Ph.D. student standing or permission of instructor. Exploration of the performance aspects of advanced computer systems and parallel architecture, design choices of computer system and architecture implementation, and use of quantitative performance models to evaluate each choice. The course includes a project for developing or evaluating a selected computer system architecture. Topics include: Parallel computer architecture of Central Processing Unit (CPU) and Graphic Processing Unit (GPU); domain specific architectures such as tensor processing unit or AI accelerators; CPU/GPU memory hierarchy and caching architecture; coherence of memory systems; discrete memory system and offloading computation of accelerator architecture; performance models and metrics for computation; techniques and tools for performance analysis and optimization.

ITCS 8144. Operating Systems Design. (3) Prerequisite(s): ITCS 8114 or permission of instructor. Introduction to features of a large-scale operating system with emphasis on resource-sharing environments. Computer system organization; resource management; multiprogramming; multi-processing; file systems; virtual machine concepts; protection and efficiency.

ITCS 8145. Parallel Computing. (3) Prerequisite(s): CCI graduate standing or permission of department. Cross-listed Course(s): ITCS 6145. Introduction to a wide range of applications, including database systems, web browsers, video games and Artificial Intelligence systems to analyze and improve the performance of applications and analyze parallel codes and systems to predict their performance and bottlenecks. Topics include: Programming multi-core systems and GPUs, theoretical models of parallel computing, performance analysis, parallel algorithms, and real-world applications of parallel computing. Students will learn how to analyze the performance of a parallel application; construct parallel applications to run on CPU

and GPU systems; and optimize complex existing applications to derive better application runtimes.

ITCS 8150. Artificial Intelligence. (3) Prerequisite(s): Ph.D. student standing or permission of instructor. Introduction to core ideas in AI. Heuristic versus algorithmic methods; problem solving; game playing and decision making; automatic theorem proving; pattern recognition; adaptive learning; projects to illustrate theoretical concepts.

ITCS 8151. Intelligent Robotics. (3) Prerequisite(s): Ph.D. student standing and an undergraduate course in linear algebra, or permission of instructor. General introduction to spatial descriptions and transformations, and manipulator position and motion. More study on robot planning, programming, sensing, vision, and CAD/CAM.

ITCS 8152. Robot Motion Planning. (3) Prerequisite(s): ITCS 8114 or permission of instructor. Introduction to algorithmic techniques for robot motion planning. Topics include: configuration space representations, roadmap methods, cell decomposition methods, potential field techniques, randomized path planning, collision detection, nonholonomic motion planning, multiple robot coordination, and manipulation planning. These techniques are motivated by applications of motion planning to mobile robots and robot manipulators, assembly planning, computer aided design, computer graphics, and bioinformatics.

ITCS 8155. Knowledge-Based Systems. (3) Prerequisite(s): ITCS 8162 or permission of instructor. Knowledge systems; knowledge discovery; association rules; action rules, hierarchical classifiers, cascade classifiers, query languages and their semantics; cooperative and collaborative systems; ontology and metadata; flexible query answering; chase algorithms and data sanitization methods; decision support systems in medicine; and automatic indexing of music.

ITCS 8156. Machine Learning. (3) Introduction to advanced concepts, techniques, and algorithms underlying the theory and practice of machine learning (ML) and deep learning. The description of the formal properties of the algorithms will be supplemented with motivating applications in areas such as natural language processing, computer vision, education, or medicine. Topics include: bias-variance trade-off; ensemble methods; autoencoders, convolutional neural networks, (gated) recurrent neural networks and attention; Transformer and language models; probabilistic graphical models and structured outputs; energy-based models, GANs, VAEs, and diffusion; time series forecasting; explainability and probing of ML models; bias in ML models; theoretical underpinnings of deep learning; deep reinforcement learning (RL).

ITCS 8157. Visual Databases. (3) Prerequisite(s): ITCS 8160 or permission of instructor. Topics include: Representation of visual content, querying visual databases, content-based interactive browsing and navigation, system architecture, similarity models, indexing visual databases, data models and knowledge structures, image retrieval by similarity, and video retrieval by content.

ITCS 8160. Database Systems. (3) Prerequisite(s): Ph.D. student standing or permission of instructor. The modeling, programming, and implementation of database systems. Focuses on relational database systems, but may also address non-relational databases or other advanced topics. Topics include: (1) modeling: conceptual data modeling, ER diagram, relational data model, schema design and refinement; (2) programming: relational algebra and calculus, SQL, constraints, triggers, views; (3) implementation: data storage, indexing, query execution, query optimization, and transaction management; and (4) advanced: semi-structured data model, XML, and other emerging topics.

ITCS 8161. Advanced Topics in Database Systems. (3) Prerequisite(s): ITCS 8160 or permission of instructor. Continuation of ITCS 8160. Topics include: deductive databases; semantic query processing; intelligent and cooperative query languages; distributed databases; active databases; heterogeneous databases, multimedia databases; data and knowledge interchange; multidatabase systems; very large databases.

ITCS 8162. Knowledge Discovery in Databases. (3) Exploration of knowledge discovery and data mining algorithms for data analysis, with an emphasis on techniques suitable for large datasets. Topics include: Data Operations (fusion, reduction, sanitization, balancing), Association/Representative Rules, Clustering, High Dimensional & Distributed Data Mining, Dimensionality Reduction, Link Analysis, and Actionability (Action and Meta-Action Rules). The curriculum also spans a diverse range of data mining areas such as Mining Data Streams, Web Mining, Web Advertising, Knowledge-Based Recommendation Systems, and Personalization. Throughout the course, a special focus will be placed on practical applications, showcasing diverse examples from fields like healthcare and business.

ITCS 8163. Data Warehousing. (3) Prerequisite(s): ITCS 8160 or ITIS 8120. Topics include: use of data in discovery of knowledge and decision making; the limitations of relational databases and SQL queries; the warehouse data models: multidimensional, star, snowflake; architecture of data warehouse and the process of warehouse construction; data consolidation from various sources; optimization; techniques for data transformation and knowledge extraction; relations with enterprise modeling.

ITCS 8165. Coding and Information Theory. (3) Cross-listed Course(s): ECGR 8165. Prerequisite(s): knowledge of probability theory or permission of instructor. Information theory; coding theory; Shannon's theorem; Markov process; channel capacity; data transmission codes; error correcting codes; data compression; data encryption.

ITCS 8166. Computer Communications and Networks. (3) Prerequisite(s): Ph.D. student standing or permission of instructor. Fundamental principles and cutting-edge technologies that underpin computer networks, including OSI layered architectures, application layer protocols, flow and congestion control protocols, routing protocols, MAC layer protocols, software-defined networking (SDN), and AI-infused protocols. The course also explores emerging applications of computer networks in the smart future, such as AI-as-a-Service, smart cities, transportation, retail, healthcare, and manufacturing. Topics include: Basics of Internet, Link-layer Protocols; Network Layer Protocols, Transport Layer Protocols, Application Layer Protocols, Next-generation Wireless Networking, Software-defined Networking, AI-enabled/AI-native Networking

ITCS 8167. Advanced Networking Protocols. (3) Prerequisite(s): ITCS 8166 or ITCS 8168. Focuses on advanced networking concepts and protocols related to the design, implementation, integration, and management of networking and communication systems. Topics include: topology control protocols, ad hoc routing protocols, power management protocols, distributed data processing protocols for various networking systems (Internet, wireless mesh networks, ad hoc networks, sensor networks, peer-to-peer networks).

ITCS 8168. Wireless Communication Networks. (3) Prerequisite(s): Ph.D. student standing in CS, SIS, ECE, or Optics and a prior course in networking, or permission of instructor. An overview of mobile systems and wireless networking technologies. Emphasis on resource management, routing and quality of service at the MAC and networking layers for mobile systems. Students undertake a semester long research project to survey the research literature and identify specific challenges for cellular telecommunications, wireless LANS, ad hoc networks, mesh networks or sensor networks.

ITCS 8169. Computer Vision. (3) Prerequisite(s): ITCS 5356 or ITCS 3156 or permission of instructor. Cross-listed Course(s): ITCS 6169. Computer Vision involves teaching machines to interpret and understand the visual world, namely images and videos. In this course, students will learn advanced computer vision algorithms applied in real-world scenarios. As a project-based curriculum, it offers hands-on experience by enabling students to implement industry-relevant computer vision algorithms. Additionally, the course will explore state-of-the-art approaches to visual representation learning.

ITCS 8190. Cloud Computing for Data Analysis. (3) Cross-listed Course(s): ITCS 6190. Prerequisite(s): ITCS 8114 or permission of instructor; familiarity with Java, Unix, Data Structures and Algorithms, Linear Algebra, and Probability and Statistics; good programming skills and a solid mathematical background. Introduction to the basic principles of cloud computing for data-intensive applications. Focuses on parallel computing using Google's MapReduce paradigm on Linux clusters, and algorithms for large-scale data analysis applications in web search, information retrieval, computational advertising, and business and scientific data analysis. Students read and present research papers on these topics, and implement programming projects using Hadoop, an open source implementation of Google's MapReduce technology, and related NoSQL technologies for analyzing unstructured data.

ITCS 8224. Biomedical Image Processing. (3) Prerequisite(s): Ph.D. student standing and undergraduate course in linear algebra, or permission of instructor. Topics include: Review of image processing and pattern recognition (2-D Fourier transforms, 2-D Wavelet transform, denoising of medical images); origin and processing of X-ray images; CT images; MRI images; ultrasonic images; PET images; thermal images; electrical impedance images; cross-registration between images of different source; stereotactic neurosurgery; stereotactic radiosurgery/radiotherapy; robot-assisted surgery.

ITCS 8322. Complex Adaptive Systems. (3) Cross-listed Course(s): DSBA 6322, HCIP 6322, ITCS 6322, ITIS 6322, and ITIS 8322. Prerequisite(s): Permission of instructor. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), nonlinear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. Covers these and similar topics in an interactive manner. Examples of our current research effort are provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity.

Software and Information Systems (ITIS)

ITIS 5010. Topics in Software and Information Systems. (3)

Prerequisite(s): CCI graduate standing or permission of department. Topics in software and information systems selected to supplement the regular course offerings. *May be repeated for credit with change of topic.*

ITIS 5101. Foundations of Programming. (3) Prerequisite(s): Graduate standing and permission of department. Takes students from no experience in programming to having an understanding of how to produce software that is relevant to their domain knowledge. Students learn to think about problem solutions that are systematic and repeatable (algorithms), and translatable to code. Topics include: Algorithmic thinking; Programming with primitive data types; Introduction to Object-Oriented programming; Recovering gracefully from errors and exceptions; Unit testing; Recursion; ADTs (Stacks & Queues, Linked Nodes, Lists, Trees, Hash Functions); Introduction to Big O Analysis and ADTs; Sorting and Searching.

ITIS 5135. Web-Based Application Design and Development. (3) Prerequisite(s): Basic programming skills and permission of department. Students learn to design and develop interactive webpages with significant focus on programming. Topics include: components of a web application, web design, and development guidelines, coding with programming languages used for web applications, manipulation of the Document Object Model (DOM), event-driven programming, asynchronous exchange of data, and web accessibility. By the end of the course, students develop an interactive and accessible website with practical intent.

ITIS 5166. Backend Application Development. (3) Cross-listed Course(s): HCIP 5166; ITIS 4166. Prerequisite(s): CCI graduate standing or permission of department. Core principles and advanced techniques of backend development. Through hands-on projects, students will learn API development, secure authentication methods, and deployment strategies using containerization and continuous integration/ deployment pipelines.

ITIS 5180. Mobile Application Development. (3) Cross-listed Course(s): ITCS 5180. Prerequisite(s): CCI graduate standing or permission of department. Mobile platforms are at the center of attention of users and organizations nowadays. Most organizations and businesses are rapidly migrating toward the cloud and need to provide a fast and easy mechanism for users to stay connected to their services. Mobile applications are the top trend nowadays given the high variety of new mobile devices and platforms such as Apple's iOS and Google's Android. In this course, students

are introduced to the foundations of mobile development and its unique requirements and constraints. Students design and build a variety of mobile applications with a hands-on and project-based approach.

ITIS 5221. Secure Programming and Penetration Testing. (3)

Techniques for web application penetration testing, secure software development techniques for network based applications. Automated approaches such as static code analysis and application scanning are also discussed.

ITIS 5246. Competitive Cyber Defense. (3) Cross-listed Course(s): ITIS 4246. Hands-on experience with designing, deploying, securing, and defending enterprise network services. Topics include: securing network communication, single-sign-on services, firewall and IDS deployment, security policy design and development, log analysis, securing critical network infrastructure, network access control policies, penetration testing tools, secure information flow, and secrets management. Students are expected to demonstrate their ability to defend these services against adversary attacks.

ITIS 5250. Computer Forensics. (3) Cross-listed Course(s): HCIP 5250. Prerequisite(s): CCI graduate standing or permission of department. The identification, extraction, documentation, interpretation, and preservation of computer media for evidentiary purposes and/or root cause analysis. Topics include: techniques for discovering digital evidence; responding to electronic incidents; tracking communications through networks; understanding electronic media, crypto-literacy, data hiding, hostile code, and Windows™ and UNIX™ system forensics; and the role of forensics in the digital environment.

ITIS 5260. Introduction to Security Analytics. (3) Cross-listed Course(s): ITIS 4260. Pre- or Corequisite(s): ITIS 6200. Cross-listed Course(s): ITIS 4260. Focuses on security-related sense-making and decision-making based on data analytics techniques. Topics include: data cleaning and storage techniques, introduction to R, clustering analysis and statistical inference for security; log analysis; event correlation, anomaly detection, cyber threat intelligence, and use of public cybersecurity information resources.

ITIS 5261. Introduction to Secured Cloud Computing. (3) Prerequisite(s): ITSC 3146 or equivalent. Cross-listed Course(s): ITIS 4261. Design and deployment of secure and robust cloud computing solutions. Instructions will rely on hands-on labs. It focuses on selecting appropriate components in the cloud and securely configuring them to support a specific application.

ITIS 5280. Advanced Mobile Application Development. (3) Prerequisite(s): ITCS 5180 or ITIS 5180. Exploration of a wide range of mobile application development concepts, frameworks, and patterns. Introduction to real world

mobile application projects in partnership with university and industrial partners, as well as Agile Development concepts and up-to-date Agile and team management tools. The course is project-based; students are paired with a subject matter expert and work on a single project throughout the semester, which is expected to result in a functioning mobile app prototype.

ITIS 5310. Web Mining. (3) Pre- or Corequisite(s): ITIS 6120, ITCS 6610, or permission of department. Topics include: measuring and modeling the Web; crawling, Web search and information retrieval; unsupervised learning, supervised learning, semi-supervised learning in Web context; social network analysis and hyperlink analysis; text parsing and knowledge representation.

ITIS 5331. Web-Based Mobile and IoT Firmware Security. (3) An introduction to recent security topics in web-based mobile and Internet of Things (IoT) software security. Explores vulnerability types, development of vulnerable app testbeds, exploit creation, and software defenses.

ITIS 5350. Design Prototyping. (3) Cross-listed Course(s): ITIS 4350. Introduction to theory and approaches for rapid prototyping in interface design. Explores theoretical constructs behind rapid prototyping and how it relates to Human-Computer Interaction. Students study evolutionary prototyping. This begins with low fidelity prototyping techniques such sketching and paper prototyping, and progressively iterate through higher fidelity prototyping techniques using digital tools. In addition to software prototyping, the course also provides an introduction to physical prototyping.

ITIS 5353. Social Technology Design. (3) Cross-listed Course(s): ITIS 4353. Social media platforms such as Wikipedia, Facebook, TikTok, Discord, Twitch, and YouTube are among the most popular in the world. They feature some of the most interesting social interactions and social dynamics that continue to fascinate computing and informatics researchers. This course will examine designs for these and other technologies, principles of online communities, and the social impact of spending at least part of our lives online. Graduate students will help lead in-class activities and discussion. They also will summarize and reflect on online readings, give presentations, and complete 2-3 assignments and a small-group project. This course does not require any technical or design experience. However, skills in statistical data analysis, machine learning, programming, social-behavioral sciences, or interaction design are a plus.

ITIS 5355. Accessible Design and Implementation. (3) Cross-listed Course(s): ITIS 4355. Introduction to foundational principles of accessibility, as well as accessible practices in design and development of computing interfaces and applications. Accessibility

focuses on enabling as many people as possible to use facilities, systems, and services, even when some people's abilities are limited in some way, such as for persons with disabilities. Proactive design and development to support different ways of interacting with computing applications provides broader access and better experiences for more users. This course provides a foundational understanding of disability and assistive technology, legal considerations, and best practices for accessible design and development in computing applications.

ITIS 5358. Physical Computing. (3) Cross-listed Course(s): ITIS 4358. Physical computing considers tangible, embedded, and embodied ways that computing systems can interact directly with people and the physical world, such as in smart products and environments, wearable computing, or Internet of Things devices. This involves the design and development of physical forms using digital fabrication approaches, such as 3D printing, laser cutting, or Computer Numerical Control (CNC) techniques. It also involves the design and development of interactive systems that interact through physical forms by employing physical / sensory inputs and outputs. The course provides foundations in digital design and digital fabrication, small computing systems and programming, physical prototyping with sensors and effectors, as well as elements of user experience design for tangible computing systems.

ITIS 5360. Human-Centered AI. (3) Cross-listed Course(s): ITIS 4360. Explores the intersection of artificial intelligence and human-centered design, equipping students with the knowledge and skills to develop AI systems that are not only technically advanced but also ethical, responsible, and human-centric. Through a blend of theory and practical application, students will learn about AI technologies, ethical considerations, and methods for incorporating human perspectives. They will learn to create AI systems that align with user needs and societal values, applying principles of transparency, fairness, and accountability. The course covers key topics such as interpretability, bias mitigation, and user-centered AI interface design. Graduate students will help lead real-world case studies and projects, where they will develop AI solutions that address genuine human needs while navigating the complexities of AI ethics.

ITIS 5390. Interaction Design Projects. (3) Prerequisite(s): ITIS 6340; and CCI graduate standing or permission of department. Students will engage in project-based learning developing the skills essential for designing and implementing innovative and user-centric digital experiences. Students will learn to design low and high-fidelity prototypes, leveraging versatile platforms, to conceptualize and iterate on interactive solutions. Building on this foundation, they will learn to implement user interfaces using ReactJS, gaining proficiency in creating

responsive and engaging web applications. Emphasizing collaboration, students will work in teams on a semester-long project, integrating ethical principles and usability considerations into their designs.

ITIS 6010. Topics in Software and Information Systems. (3)

Prerequisite(s): CCI graduate standing or permission of department. Topics in software and information systems selected to supplement the regular course offerings. *May be repeated for credit with change of topic.*

ITIS 6110. Agent-Based Modeling. (3) Cross-listed Course(s):

ITIS 8110. Discusses the definition of an agent-based model, the components of a model, the implementation of a model, the comparison of an agent-based model to an equation-based model, the relationship to complex adaptive systems, and the details of how to use NetLogo to actually implement a model. Identifies when agent-based modeling is preferred over equation-based modeling. Also describes similarities and differences between the two techniques. After taking this course, students, once a complex adaptive system has been identified, are able to identify a suitable environment for a model, identify the key agents of the system, identify the key behaviors of those agents, and implement a model to illustrate the complex adaptive nature of the system with NetLogo.

ITIS 6112. Software System Design and Implementation. (3)

Cross-listed Course(s): HCIP 6112 and ITCS 6112. Prerequisite(s): CCI graduate standing or permission of department. Introduction to the techniques involved in the planning and implementation of large software systems. Emphasis on human interface aspects of systems. Planning software projects; software design process; top-down design; modular and structured design; management of software projects; testing of software; software documentation; choosing a language for software system.

ITIS 6120. Applied Databases. (3) Cross-listed Course(s):

HCIP 5160 and ITIS 8120. Prerequisite(s): CCI graduate standing or permission of department. Identification of business database needs; requirements specification; relational database model; SQL; E-R modeling; database design, implementation, and verification; distributed databases; databases replication; object-oriented databases; data warehouses; OLAP; data mining; security of databases; vendor selection; DBMS product comparison; database project management; tools for database development, integration, and transaction control.

ITIS 6150. Software Assurance. (3) Cross-listed Course(s):

ITIS 8150. Prerequisite(s): CCI graduate standing or permission of department. An introduction to software assurance education and research. Topics include: the security of software across the development life cycle

that addresses trustworthiness, predictable execution and conformance. Various aspects of secure software requirements, design, construction, verification, and validation, process and engineering management are focused on as they relate to secure software development. Students gain hands-on experience in various techniques and tools as part of a semester-long project in addition to other assignments.

ITIS 6162. Knowledge Discovery in Databases. (3) Cross-

listed Course(s): DSBA 6162, HCIP 6162, and ITCS 6162. Prerequisite(s): ITCS 6160 or ITIS 6120. Exploration of the entire knowledge discovery process. Topics include: setting up a problem, data preprocessing and warehousing, data mining in search for knowledge, knowledge evaluation, visualization and application in decision making. A broad range of systems, such as OLAP, LERS, DatalogicR+, C4.5, AQ15, Forty-Niner, CN2, QRAS, and discretization algorithms are also covered.

ITIS 6163. Data Warehousing. (3) Cross-listed Course(s):

ITCS 6163. Prerequisite(s): ITCS 6160 or ITIS 6120. Topics include: use of data in discovery of knowledge and decision making; the limitations of relational databases and SQL queries; the warehouse data models: multidimensional, star, snowflake; architecture of data warehouse and the process of warehouse construction; data consolidation from various sources; optimization; techniques for data transformation and knowledge extraction; relations with enterprise modeling.

ITIS 6167. Network Security. (3) Cross-listed Course(s):

HCIP 6167. Prerequisite(s): CCI graduate standing or permission of department. Examines the issues related to network security. Topics include: network security background and motivation, network centric threats, network authentication and identification, network security protocols, firewall, IDS, security in wireless environments, email security, instant message security, network application security, and network based storage security. There are heavy lab based components in this course.

ITIS 6177. System Integration. (3) Pre- or Corequisite(s): ITIS

5166 or equivalent, or permission of department. Examines the issues related to system integration. Topics include: data integration, business process integration, integration architecture, middleware, system security, and system management.

ITIS 6180. Foundations of Health Informatics. (3) Cross-

listed Course(s): ITIS 8180. Prerequisite(s): Graduate standing in computer science, information technology, health informatics, or related discipline. An overview of foundational concepts and methods in healthcare systems, technologies, and policies that are critical for successful research in health informatics. Students explore recurring themes, issues, and applications most frequently

encountered in the field. The course is both technical and rigorous, and will involve both theoretical analysis and substantial projects. Topics include: an overview of issues, systems and technologies in health informatics and in-depth discussion of data standards, data integration, data analytics, and evaluation methods. Students who take this course gain the skills and knowledge necessary to conduct research in health informatics.

ITIS 6188. Text Mining and Information Retrieval. (3) Cross-listed Course(s): DSBA 6188. General computational techniques for analyzing large amounts of text data as well as basic techniques for information retrieval. By introducing text mining (TM) and information retrieval (IR) in a unified framework, this course emphasizes the importance of integration of IR and TM needed to build the two major types of text information systems, i.e., search engines (such as Google, MS Bing, etc.) and text analytics systems, for text information access and text analysis.

ITIS 6200. Principles of Information Security and Privacy. (3) Cross-listed Course(s): HCIP 6200 and ITIS 8200. Prerequisite(s): CCI graduate standing or permission of department. Topics include: security concepts and mechanisms; security technologies; authentication mechanisms; mandatory and discretionary controls; basic cryptography and its applications; database security, intrusion detection and prevention; assurance requirement, assurance class, evaluation methods and assurance maintenance; anonymity and privacy issues for information systems.

ITIS 6210. Access Control and Security Architecture. (3) Cross-listed Course(s): HCIP 6210. Pre- or Co-requisite(s): ITIS 6200. Discusses objectives, formal models, and mechanisms for access control; and access control on commercial off-the-shelf (COTS) systems. Examines the issues related to security architectures and technologies for authorization. Topics include: cryptographic infrastructure, distributed systems security architectures, database systems security architectures, Internet security architectures, network security architectures and e-commerce security architectures.

ITIS 6214. Usable Security and Privacy. (3) Cross-listed Course(s): ITIS 8214. Much of the work into security and privacy solutions ignore a critical element: the human who must interact with those solutions. In this course, we investigate privacy and security from a user-centered point of view. How do people think about privacy and security? How do they interact with current applications and solutions? What should be considered in designing user-friendly security systems? This course introduces students to a variety of usability and user interface issues related to privacy and security as well as examine potential designs and solutions.

ITIS 6216. Introduction to Cognitive Science. (3) Cross-listed Course(s): PSYC 6216 and ITCS 6216. Multiple perspectives on the study of intelligent systems. Broad coverage of such topics as philosophy of mind; human memory processes; reasoning and problem solving; artificial intelligence; language processing (human and machine); neural structures and processes; and vision. Also included is participation in the cognitive science seminar.

ITIS 6220. Data Privacy. (3) Pre- or Corequisite(s): ITIS 6200, full graduate standing, or permission of department. Topics include: privacy concepts, policies, and mechanisms; identity, anonymity, and confidentiality; private data analysis and database sanitization; privacy-preserving data mining techniques including k-anonymity, randomization, and secure function evaluation; privacy issues in social networks, RFID, and healthcare applications.

ITIS 6230. Enterprise and Infrastructure Protection. (3) Cross-listed Course(s): HCIP 6230 and ITIS 8230. Pre- or Corequisite(s): ITIS 6200. Methodologies, tools, and technologies that are important for protecting data and network security in both enterprises and critical infrastructures. Topics include: the prevent-detect-response strategy for enterprise security, policies, techniques, processes and methodologies for risk assessment and management, infrastructure reconnaissance and vulnerability analysis, basics of forensics, methodologies for continuous operation and recovery from disasters.

ITIS 6240. Applied Cryptography. (3) Prerequisite(s): CCI graduate standing or permission of department. Provides students with an understanding of modern cryptographic techniques, algorithms and protocols that are of fundamental importance to the design and implementation of security critical applications. Covers not only standard cryptographic techniques, but also exposes students to the latest advances in applied cryptography. Topics include: secret and public key ciphers, stream ciphers, one-way hashing algorithms, authentication and identification, digital signatures, key establishment and management, secret sharing and data recovery, public key infrastructures, and efficient implementation.

ITIS 6260. Quantum Computing. (3) Cross-listed Course(s): ITIS 8260. Prerequisite(s): Full graduate standing or permission of department. The fundamental concepts and algorithms of quantum mechanics, quantum computation, quantum information theory, and post quantum cryptography. Topics include: quantum mechanics, quantum states, quantum entanglement, quantum measurement, qubits, quantum computation, universal quantum gates, reversible computation, quantum algorithms, quantum Fourier transform, quantum search, quantum computers, quantum noise and quantum

operations, quantum error-correction, and post-quantum cryptography.

ITIS 6268. Wireless Network Security. (3) Cross-listed Course(s): ITIS 8268. Prerequisite(s): ITIS 6167 or permission of department. Introduction to state-of-art techniques in wireless security. Topics include: Secure and resilient data aggregation, Key pre-distribution and management, Security in group communication, Trust establishment and management, Denial-of-service attacks, Secure routing, Secure localization and information privacy, and more. The application environments cover mobile ad hoc networks, sensor networks, Internet of Things, Cyber Physical Systems, and Cellular Networks.

ITIS 6270. Blockchain, Cryptocurrency, and Distributed Ledger Technologies. (3) Cross-listed Course(s): ITIS 8270. Prerequisite(s): Full graduate standing or permission of department. Provides an understanding of the fundamental concepts and technologies of distributed ledger technologies (DLT), blockchains, consensus techniques, cryptocurrency, and smart contracts. Topics include: blockchains, cryptocurrency, distributed ledger technologies, smart contract programming languages, and their applications.

ITIS 6320. Cloud Data Storage. (3) Cross-listed Course(s): ITIS 8320. Prerequisite(s): CCI graduate standing or permission of department. The design and implementation of cloud storage and big data systems and the architecture and characteristics of components on which cloud storage systems are built. Topics include: storage device hardware, file systems, mirroring and RAID, array coding techniques, storage area networks (SAN), network-attached storage (NAS), cloud storage and big data, DB in clouds, relational storage models, key value stores and other No-SQL mechanisms, data consistency and availability in the cloud, cloud data privacy and security.

ITIS 6330 Malware Analysis. (3) Cross-listed Course(s): ITIS 8330. Pre- or Corequisite(s): ITIS 6200. Introduction to the most important topics in malware analysis, including system security basics, malware concept/classification, attacks, static analysis, dynamic analysis, sandboxes, emulators, and virtual machine introspection. Students finish a series of hands-on labs in order to learn how to use common analysis tools to dissect real-world malware in a prebuilt environment. Students are also exposed to the challenges imposed by malware attempt to evade or thwart analysis.

ITIS 6342. Information Technology Project Management. (3) Cross-listed Course(s): HCIP 6342. Prerequisite(s): CCI graduate standing or permission of department. Introduction to problems associated with managing information technology projects involving, particularly, integration of systems, development of client-specific

solutions, and project justification. Moves beyond the classic techniques of project management and integrate communication software/systems, multi-site, multi-client facilities projects, cultural issues involved with managing interdisciplinary teams, and the effect of rapid technological obsolescence on project justification, funding and continuance.

ITIS 6362. Information Technology Ethics, Policy, and Security. (3) Prerequisite(s): CCI graduate standing or permission of department. Management of Information technology involves understanding the broader issues of ethics, policy and security. The growth in Internet usage and E-commerce require IT professionals to consider issues pertaining to data protection, regulation, and appropriate use and dissemination of information. The course is designed to be team-taught by professionals in the field.

ITIS 6300. Human-Centered Design. (3) Cross-listed Course(s): ITIS 8300. Prerequisite(s): CCI graduate standing or permission of department. Introduces and provides experience in concepts and methods for human-computer interaction, with an emphasis on methods for human-centered design and evaluation of user experiences with IT. Topics include: design principles, need finding, design prototypes, and evaluation of interaction designs to make them compatible with human capabilities and expectation.

ITIS 6318. Personalization and Recommender Systems. (3) Cross-listed Course(s): ITIS 8318. Prerequisite(s): CCI graduate standing or permission of department. An introduction to the application of personalization and recommender systems techniques in information systems. Topics include: historical, individual and commercial perspectives; underlying approaches to content-based and collaborative recommendation techniques for building user models; acceptance issues; and case-studies drawn from research prototypes and commercially deployed systems.

ITIS 6322. Complex Adaptive Systems. (3) Cross-listed Course(s): DSBA 6322, HCIP 6322, ITCS 6322, ITCS 8322, and ITIS 8322. Prerequisite(s): CCI graduate standing or permission of department. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), nonlinear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more

complex than the behavior of the parts. This course covers those and similar topics in an interactive manner. Examples of current research efforts are provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; and complexity.

ITIS 6326. Network Science. (3) Cross-listed Course(s): DSBA 6326, HCIP 6326, and ITIS 8326. Prerequisite(s): CCI graduate standing or permission of department. Network Science helps students design faster, more resilient communication networks; revise infrastructure systems such as electrical power grids, telecommunications networks, and airline routes; model market dynamics; understand synchronization in biological systems; and analyze social interactions among people. It examines the various kinds of networks (regular, random, small-world, influence, scale-free, and social) and applies network processes and behaviors to emergence, epidemics, synchrony, and risk. This course integrates concepts across computer science, biology, physics, social network analysis, economics, and marketing.

ITIS 6328. Systems Dynamics. (3) Cross-listed Course(s): ITIS 8328. Prerequisite(s): CCI graduate standing or permission of department. Introduction to systems thinking and the systems dynamics world view, tools for eliciting and mapping the structure and dynamics of complex systems, tools for modeling and simulation of complex systems, and procedures for testing and improving models. Helps students outline and evaluate dynamic relationships and factors that influence organizations' performance, market position, decision-making, and policy evaluations. Integrates concepts across information systems, computer science, business, engineering, economics, and social sciences. Based on 3-hour weekly lectures and hands-on project assignment.

ITIS 6498. IT Internship Project. (3) Prerequisite(s): permission of department. Complete a team-based project that is originated from an IT organization and approved by the department.

ITIS 6880. Individual Study. (1 to 3) Prerequisite(s): At least 9 graduate ITCS/ITCS hours and permission of department. With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects. *May be repeated for credit.*

ITIS 6991. Information Technology Thesis. (1 to 6) Prerequisite(s): Full standing in the M.S. in Information Technology program and permission of department. Graduate thesis research. A detailed exploration of an area of information technology chosen for thesis research. *Graded on a Satisfactory Progress/Unsatisfactory Progress*

or Standard Letter Grade basis each term. May be repeated for credit; no more than 6 credit hours may be applied to the M.S. degree requirements.

ITIS 6999. SFS Research. (3) Research for CyberCorps Scholarship for Service (SFS) program. *May be repeated for credit; no more than 3 credit hours may be applied to the M.S. degree requirements.*

ITIS 8010. Topics in Software and Information Systems. (3) Prerequisite(s): permission of department. Topics in software and information systems selected to supplement the regular course offerings. *May be repeated for credit with change of topic.*

ITIS 8110. Agent-Based Modeling. (3) Cross-listed Course(s): ITIS 6110. Discusses the definition of an agent-based model, the components of a model, the implementation of a model, the comparison of an agent-based model to an equation-based model, the relationship to complex adaptive systems, and the details of how to use NetLogo to actually implement a model. Identifies when agent-based modeling is preferred over equation-based modeling. Also describes similarities and differences between the two techniques. After taking this course, students, once a complex adaptive system has been identified, are able to identify a suitable environment for a model, identify the key agents of the system, identify the key behaviors of those agents, and implement a model to illustrate the complex adaptive nature of the system with NetLogo.

ITIS 8112. Software System Design and Implementation. (3) Cross-listed Course(s): ITCS 8112. Prerequisite(s): Ph.D. student standing or permission of instructor. Introduction to the techniques involved in the planning and implementation of large software systems. Emphasis on human interface aspects of systems. Planning software projects; software design process; top-down design; modular and structured design; management of software projects; testing of software; software documentation; choosing a language for software system.

ITIS 8120. Applied Databases. (3) Cross-listed Course(s): HCIP 5160 and ITIS 6120. Prerequisite(s): Full graduate standing or permission of department. Identification of business database needs; requirements specification; relational database model; SQL; E-R modeling; database design, implementation, and verification; distributed databases; databases replication; object-oriented databases; data warehouses; OLAP; data mining; security of databases; vendor selection; DBMS product comparison; database project management; tools for database development, integration, and transaction control.

ITIS 8150. Software Assurance. (3) Cross-listed Course(s): ITIS 6150. Prerequisite(s): ITCS 6112, ITCS 8112, ITIS 5221, ITIS 6112, ITIS 8112, or permission of department. An introduction to software assurance education and research. Topics include: the security of software across the development life cycle that addresses trustworthiness, predictable execution and conformance. Various aspects of secure software requirements, design, construction, verification, and validation, process and engineering management are focused on as they relate to secure software development. Students gain hands-on experience in various techniques and tools as part of a semester-long project in addition to other assignments.

ITIS 8167. Network and Information Security. (3) Prerequisite(s): ITCS 6166 or equivalent. Examines the issues related network and information security. Topics include: concepts, security attacks and risks, security architectures, security policy management, security mechanisms, cryptographic algorithms, security standards, security system interoperation and case studies of the current major security systems.

ITIS 8180. Foundations of Health Informatics. (3) Cross-listed Course(s): ITIS 6180. Prerequisite(s): Graduate standing in computer science, information technology, health informatics, or related discipline. An overview of foundational concepts and methods in healthcare systems, technologies, and policies that are critical for successful research in health informatics. Students explore recurring themes, issues, and applications most frequently encountered in the field. The course is both technical and rigorous, and will involve both theoretical analysis and substantial projects. Topic include: an overview of issues, systems and technologies in health informatics and in-depth discussion of data standards, data integration, data analytics, and evaluation methods. Students who take this course gain the skills and knowledge necessary to conduct research in health informatics.

ITIS 8200. Principles of Information Security and Privacy. (3) Cross-listed Course(s): ITIS 6200 and HCIP 6200. Prerequisite(s): permission of department. Topics include: security concepts and mechanisms; security technologies; authentication mechanisms; mandatory and discretionary controls; basic cryptography and its applications; intrusion detection and prevention; information systems assurance; anonymity and privacy issues for information systems.

ITIS 8210. Access Control and Security Architecture. (3) Prerequisite(s): ITIS 8200. Discusses objectives, formal models, and mechanisms for access control; and access control on commercial off-the-shelf (COTS) systems. Examines the issues related to security architectures and technologies for authorization. Topics include: cryptographic infrastructure, distributed systems security architectures, Internet security architectures, network

security architectures and e-commerce security architectures.

ITIS 8214. Usable Security and Privacy. (3) Cross-listed Course(s): ITIS 6214. Much of the work into security and privacy solutions ignore a critical element: the human who must interact with those solutions. In this course, we investigate privacy and security from a user-centered point of view. How do people think about privacy and security? How do they interact with current applications and solutions? What should be considered in designing user-friendly security systems? This course introduces students to a variety of usability and user interface issues related to privacy and security as well as examine potential designs and solutions.

ITIS 8220. Data Privacy. (3) Pre- or Corequisite(s): ITIS 6200, full graduate standing, or permission of department. Topics include: privacy concepts, policies, and mechanisms; identity, anonymity, and confidentiality; private data analysis and database sanitization; privacy-preserving data mining techniques including k-anonymity, randomization, and secure function evaluation; privacy issues in social networks, RFID, and healthcare applications.

ITIS 8230. Enterprise and Infrastructure Protection. (3) Cross-listed Course(s): HCIP 6230 and ITIS 6230. Prerequisite(s): ITIS 8200. Methodologies, tools, and technologies that are important for protecting data and network security in both enterprises and critical infrastructures. Topics include: the prevent-detect-response strategy for enterprise security, policies, techniques, processes and methodologies for risk assessment and management, infrastructure reconnaissance and vulnerability analysis, basics of forensics, methodologies for continuous operation and recovery from disasters.

ITIS 8240. Applied Cryptography. (3) Prerequisite(s): Graduate standing or permission of department. Provides students with an understanding of modern cryptographic techniques, algorithms and protocols that are of fundamental importance to the design and implementation of security critical applications. The course not only covers standard cryptographic techniques, but also exposes students to the latest advances in applied cryptography. Topics include: secret and public key ciphers, stream ciphers, one-way hashing algorithms, authentication and identification, digital signatures, key establishment and management, secret sharing and data recovery, public key infrastructures, and efficient implementation.

ITIS 8260. Quantum Computing. (3) Cross-listed Course(s): ITIS 6260. Prerequisite(s): Full graduate standing or permission of department. The fundamental concepts and algorithms of quantum mechanics, quantum computation, quantum information theory, and post quantum

cryptography. Topics include: quantum mechanics, quantum states, quantum entanglement, quantum measurement, qubits, quantum computation, universal quantum gates, reversible computation, quantum algorithms, quantum Fourier transform, quantum search, quantum computers, quantum noise and quantum operations, quantum error-correction, and post-quantum cryptography.

ITIS 8268. Wireless Network Security. (3) Cross-listed Course(s): ITIS 6268. Prerequisite(s): ITIS 6167 or permission of department. Introduction to state-of-art techniques in wireless security. Topics include: Secure and resilient data aggregation, Key pre-distribution and management, Security in group communication, Trust establishment and management, Denial-of-service attacks, Secure routing, Secure localization and information privacy, and more. The application environments cover mobile ad hoc networks, sensor networks, Internet of Things, Cyber Physical Systems, and Cellular Networks.

ITIS 8270. Blockchain, Cryptocurrency, and Distributed Ledger Technologies. (3) Cross-listed Course(s): ITIS 6270. Prerequisite(s): Full graduate standing or permission of department. Provides an understanding of the fundamental concepts and technologies of distributed ledger technologies (DLT), blockchains, consensus techniques, cryptocurrency, and smart contracts. Topics include: blockchains, cryptocurrency, distributed ledger technologies, smart contract programming languages, and their applications.

ITIS 8300. Human-Centered Design. (3) Cross-listed Course(s): ITIS 6300. Prerequisite(s): Full graduate standing or permission of department. Introduces and provides experience in concepts and methods for human-computer interaction, with an emphasis on methods for human-centered design and evaluation of user experiences with IT. Topics include: design principles, need finding, design prototypes, and evaluation of interaction designs to make them compatible with human capabilities and expectation.

ITIS 8318. Personalization and Recommender Systems. (3) Cross-listed Course(s): ITIS 6318. Prerequisite(s): Full graduate standing or permission of department. Introduction to the application of personalization and recommender systems techniques in information systems. Topics include: historical, individual and commercial perspectives; underlying approaches to content-based and collaborative recommendation techniques for building user models; acceptance issues; and case-studies drawn from research prototypes and commercially deployed systems.

ITIS 8320. Cloud Data Storage. (3) Cross-listed Course(s): ITIS 6320. Prerequisite(s): Full graduate standing or permission of department. The design and implementation of cloud storage and big data systems and the

architecture and characteristics of components on which cloud storage systems are built. Topics include: storage device hardware, file systems, mirroring and RAID, array coding techniques, storage area networks (SAN), network-attached storage (NAS), cloud storage and big data, DB in clouds, relational storage models, key value stores and other No-SQL mechanisms, data consistency and availability in the cloud, cloud data privacy and security.

ITIS 8322. Complex Adaptive Systems. (3) Cross-listed Course(s): DSBA 6322, HCIP 6322, ITCS 6322, ITCS 8322, and ITIS 6322. Prerequisite(s): Permission of instructor. Complex adaptive systems (CAS) are networked (agents/part interact with their neighbors and, occasionally, distant agents), nonlinear (the whole is greater than the sum of its parts), adaptive (the system learns to change with its environment), open (new resources are being introduced into the environment), dynamic (the change is a norm), emergent (new, unplanned features of the system get introduced through the interaction of its parts/agents), and self-organizing (the parts organize themselves into a hierarchy of subsystems of various complexity). Ant colonies, networks of neurons, the immune system, the Internet, social institutions, organization of cities, and the global economy are a few examples where the behavior of the whole is much more complex than the behavior of the parts. Covers these and similar topics in an interactive manner. Examples of our current research effort will be provided. Topics include: Self-organization; emergent properties; learning; agents; localization affect; adaptive systems; nonlinear behavior; chaos; complexity.

ITIS 8326. Network Science. (3) Cross-listed Course(s): DSBA 6326, HCIP 6326, and ITIS 6326. Prerequisite(s): Full graduate standing or permission of department. Network Science helps students design faster, more resilient communication networks; revise infrastructure systems such as electrical power grids, telecommunications networks, and airline routes; model market dynamics; understand synchronization in biological systems; and analyze social interactions among people. It examines the various kinds of networks (regular, random, small-world, influence, scale-free, and social) and applies network processes and behaviors to emergence, epidemics, synchrony, and risk. This course integrates concepts across computer science, biology, physics, social network analysis, economics, and marketing.

ITIS 8328. Systems Dynamics. (3) Cross-listed Course(s): ITIS 6328. Prerequisite(s): CCI graduate standing or department approval. Introduction to systems thinking and the systems dynamics world view, tools for eliciting and mapping the structure and dynamics of complex systems, tools for modeling and simulation of complex systems, and procedures for testing and improving models. Helps students outline and evaluate dynamic relationships and factors that influence organizations' performance, market

position, decision-making, and policy evaluations. Integrates concepts across information systems, computer science, business, engineering, economics, and social sciences. Based on 3-hour weekly lectures and hands-on project assignment.

ITIS 8330 Malware Analysis. (3) Cross-listed Course(s): ITIS 6330. Prerequisite(s): ITIS 8200. Introduction to the most important topics in malware analysis, including system security basics, malware concept/classification, attacks, static analysis, dynamic analysis, sandboxes, emulators, and virtual machine introspection. Students finish a series of hands-on labs in order to learn how to use common analysis tools to dissect real-world malware in a prebuilt environment. Students are also exposed to the challenges imposed by malware attempt to evade or thwart analysis.

ITIS 8350. Rapid Prototyping with HCI Design Patterns. (3) Designed to teach the Rapid Prototyping Design Patterns process. An active learning course designed to expose students to the many forms of rapid prototyping software and devices. The focus is on the use of common design patterns and how to represent them quickly and inexpensively for the purpose of allowing many rapid design iterations prior to the coding of solutions. This course can be considered a communication course where communication between designers and developers occurs through prototyped artifacts and accompanying documentation. Design patterns can be considered the vocabulary of interaction and interface design, and so learning this vocabulary is an important aspect of the course. Prototyping in this course spans all types of devices and platforms: desktop, mobile, web, tabletop, tablet, etc. The theory of rapid prototyping is covered in video lectures that are consumed as part of the student's preparation outside of class. Class time is devoted to hands-on practice of the various rapid prototyping methods. Assignments involve applying the techniques learned in class to a variety of problem spaces and platforms, and the peer-critique of other student's designs. Evaluation is based on both understanding of the theory and on the methodological skills gained, as demonstrated through the individual or paired assignments. Students are also expected to write a scholarly article that examines some aspect of prototyping as a part of the design process.

Computing and Information Systems (ITSC)

ITSC 8110. Introduction to Computing and Information Systems Research. (3) Prerequisite(s): Good standing in the Ph.D. in Computing and Information Systems Program. Computing and Information Systems has a wide range of research areas encompassing the fields of Business Information Systems, Bioinformatics, Computer Science, and Software and Information Systems. This seminar is intended to give Ph.D. in Computing and Information Systems students a sound understanding of the different research areas in Information Technology. The seminar is to be taken during the first year of studies and is intended to be the gateway to the fields within Information Technology and will enable students to select the fields matching their interests early in their studies. Through attending weekly in-depth research presentations from faculty in all participating units in the Ph.D. in Computing and Information Systems program and conducting literature surveys in areas of interest, students are expected to gain the knowledge they need to identify the areas of interest for themselves.

ITSC 8665. Graduate Teaching Seminar. (1) Preparation for an academic teaching career, by examining communication and teaching techniques in the field of Computer Science. Aims to help students develop pedagogical skills, learn about relevant research in computer science education, and practice teaching strategies in a supportive environment while benefitting from peer feedback.

ITSC 8699. Graduate Research Seminar. (1) Prerequisite(s): Good standing in the Ph.D. in Computing and Information Systems program. Exposes students to current research in Computing and Information Systems through attending weekly research presentations by other students, CIS faculty, and invited speakers. Each student is expected to give at least one presentation for the Graduate Research Seminar before graduation. Students must sign up for and receive credit for the Graduate Research Seminar every semester that they are in the Ph.D. in Computing and Information Systems program until they are admitted to Ph.D. candidacy (i.e., after the students have successfully defended the dissertation proposal). *Graded on Pass/Unsatisfactory basis. May be repeated for credit.*

ITSC 8880. Individual Study. (3) Prerequisite(s): permission of department. With the direction of a faculty member, students plan and implement appropriate objectives and learning activities to develop specific areas of expertise through research, reading, and individual projects. *May be repeated for credit.*

ITSC 8990. Pre-Dissertation Research. (1 to 6) Prerequisite(s): Good standing in the Ph.D. in Computing and Information Systems program. Students conduct research in information technology under the direction of

one or more CIS faculty. A major goal of this course is to prepare the student for the Qualifying Examination. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

ITSC 8991. Doctoral Dissertation Research. (1 to 9)

Individual investigation culminating in the preparation and presentation of a doctoral dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit; students may register for multiple sections of this course in the same semester or different semesters.*

Kinesiology (KNES)

KNES 5100. Organization and Administration of Strength and Conditioning. (3) Cross-listed Course(s): EXER 4100.

Prerequisite(s): Enrollment in M.S. in Kinesiology program. Provides the knowledge and skills pertaining to the organization, administration, and oversight of Strength and Conditioning programs, including facility design, assessing program needs, safety, legal, and ethical issues.

KNES 5115. Research Methods in Kinesiology. (3) Cross-listed Course(s): KNES 4115. Methods of inquiry for research are explored and critiqued within the fields of kinesiology. Emphasis is on developing skills useful for conducting and evaluating basic, applied, and clinical.

KNES 5232. Physiology of Human Aging. (3) Focuses on the normal physiological alterations that occur as the human progresses from a young adult to the latter stages of life. Special attention is given to interventions commonly promoted to combat the physiological changes that result from aging.

KNES 5333. Sport and Exercise Psychology. (3) Cross-listed Course(s): EXER 4333. Prerequisite(s): Enrollment in M.S. in Kinesiology or B.S. in Exercise Science program. An examination of psychosocial theories and research related to sport and exercise behavior. Aims for an understanding on the psychological factors that influence participation and performance of exercise.

KNES 6099. Special Topics in Kinesiology. (1 to 3) Topics and special problems related to issues, practices or sufficient trends in kinesiology. Institutes, workshops, seminars, and independent studies. Course *May be repeated for credit with change of topic.*

KNES 6110. Assessment of Physical Activity Across the Lifespan. (3) Prerequisite(s): Enrollment in MPH or M.S. in Kinesiology. Adequate physical activity is one of the best characterized and effective preventative medicines. Students learn how to assess physical activity behaviors and physical fitness levels of persons across the lifespan.

The class combines lecture and active learning elements to give students practical experience with relevant survey tools and fitness assessments.

KNES 6120. Advances in Clinical Exercise Physiology. (3)

Introduces concepts and topics associated with Clinical Exercise Physiology, including areas of practice in Clinical Exercise Physiology and professional development.

KNES 6121. Clinical Practice in Exercise Physiology. (3)

Knowledge and skills required in the clinical setting including operational standards, examination of current drug therapies, and legal and social considerations related to practice as a Clinical Exercise Physiologist.

KNES 6134. Exercise Prescription for Cardiopulmonary and Metabolic Disorders. (3)

Study of responses and adaptations to exercise, assessment techniques, exercise prescription, leadership and programming.

KNES 6151. Exercise Testing Methods. (3)

Introduces the basic assessment techniques used by Clinical Exercise Physiologists and Strength and Conditioning practitioners. Students will acquire knowledge and skills necessary for administration or assessments and interpretation of results.

KNES 6170. Neuromechanics of Gait and Posture. (3) The influence of central and peripheral mechanisms on gait and posture are emphasized by reviewing experimental protocols that have perturbed human movement. Instruction includes both normal and pathological studies, and the effect that interventions may have on disturbances in gait and posture.

KNES 6171. Advanced Biomechanics. (3) Prerequisite(s): Enrollment in M.S. in Kinesiology program or permission of instructor. Introduces the laws of basic mechanics and physics affecting human movement. An emphasis is placed on the mechanical principles pertaining to exercise, sport, and physical activity. Students are exposed to the principles that govern human movement through studying the application of mechanical principles in skill analysis for performance and injury prevention.

KNES 6260. Clinical Exercise Nutrition. (3) Principles of nutrition, dietary guidelines, dietary relationships to diseases and health, special populations, computerized dietary analysis.

KNES 6262. Nutrition for Sports Performance. (3)

Prerequisite(s): Graduate students enrolled in the MS in Kinesiology Strength and Conditioning concentration, or instructor permission. Provides an understanding of the key principles of sports nutrition and its practical application to both active lifestyle/recreational individuals and competitive athletes. You will learn about the impact of

training and competition on energy and macronutrient, micronutrient needs, fluid requirements and supplement guidance for specific sports. You will be required to examine the role of nutrition for individuals in terms of enhancing exercise performance, while also addressing the requirements for overall health.

KNES 6280. Advanced Exercise Physiology. (3) Advanced study of the functioning of physiological systems during exercise with emphasis on current literature and research.

KNES 6282. Skeletal Muscle for Health and Disease. (3) Prerequisite(s): Enrollment in M.S. in Kinesiology program or permission of instructor. Increase breadth of knowledge on skeletal muscle structure, signaling processes, and function from the molecular level to the whole organ. Students learn the plasticity of muscle during scenarios of growth, disuse, exercise, aging, and disease.

KNES 6285. Advanced Cardiopulmonary Physiology. (3) Provides a thorough understanding of cardiovascular physiology, ECG interpretation, and health-related applications. Examines in detail the various parameters of the cardiovascular system, the implication of disease and structural abnormalities to these parameters, and the relationship of cardiovascular function to exercise adaptation. Emphasis is placed on usage of the information in the clinical setting.

KNES 6291. Coaching Pedagogy for Strength and Conditioning Practitioners. (3) Prerequisite(s): MS in Kinesiology Strength and Conditioning concentration only. Corequisite(s): KNES 6491. Exploration of coaching methodologies tailored for strength and conditioning professionals. Designed for current and aspiring practitioners, it integrates the theoretical and practical components essential for sports performance instruction. Students will engage with evidence-based instructional models, sports psychology principles, and techniques to enhance athletic performance.

KNES 6292. Exercise Prescription for Musculoskeletal Disorders. (3) Advanced study of the clinical applications of common therapeutic modalities and rehabilitation in the treatment of injuries and illnesses associated with physical activity.

KNES 6320. Advanced Principles of Strength and Conditioning. (3) Prerequisite(s): Enrollment in M.S. in Kinesiology program or permission of instructor. Introduces advanced scientific principles that govern the development of strength and conditioning programs. Emphasizes the evidence-guided development and implementation of programs that increase strength, aerobic capacity, flexibility, speed, and agility. Prepares students for nationally recognized certifications, such as the National Strength and Conditioning exams.

KNES 6333. Pedagogy for Teaching Assistants. (3) Prerequisite(s): Permission of department. Introduces pedagogy skills to first-semester graduate teaching assistants in the Department of Applied Physiology, Health, and Clinical Sciences. Students are guided to develop and apply their teaching philosophy towards planning, implementing, and evaluating lessons on lectures, physical activities, and clinical labs.

KNES 6340. Periodization of Resistance Training. (3) Prerequisite(s): Enrollment in M.S. in Kinesiology program or permission of instructor. Introduces the theoretical concepts and applications of constructing optimal strength training programs for a large number of different types of athletes. Examines various strategies to manipulate the strength training program for optimal performance. Further prepares students for the CSCS examination offered by the NSCA.

KNES 6370. EKG Interpretation. (2) Prerequisite(s): MS in Kinesiology Clinical Exercise Physiology concentration, or instructor permission. Development of electrocardiography interpretation skills from basic rhythms to advanced cardiac disease arrhythmias. Students will learn how to identify various cardiac arrhythmias and their effect on cardiovascular function. Furthermore, students will discuss action plans for common arrhythmias.

KNES 6380. Clinical Exercise Physiology Prep. (1) Prerequisite(s): MS in Kinesiology Clinical Exercise Physiology concentration, or instructor permission. A preparatory course for the student to take the American College of Sports Medicine (ACSM) Clinical Exercise Physiologist (CEP) examination. This 8-week course will focus on the exercise and health topics that the exam candidate will likely see on the current certification exam.

KNES 6490. Advanced Practicum in Clinical Exercise Physiology. (1) Prerequisite(s): Permission of instructor. Acquisition and application of knowledge, skills, and abilities necessary for the Registered Clinical Exercise Physiologist while gaining experiential hours in an appropriate clinical setting. *May be repeated for credit up to 6 credits.*

KNES 6491. Strength and Conditioning Field Experience. (1) Prerequisite(s): MS in Kinesiology Strength and Conditioning Concentration only. Advanced Practicum in Strength and Conditioning. Acquisition and application of knowledge, skills, and abilities necessary for the Certified Strength and Conditioning Specialist while gaining experiential hours in an appropriate sports performance setting. Each practicum experience is worth one (1) credit hour. Three (3) credit hours of Advanced Practicum are required for graduation. Two of the field experience must be under different site

supervisors and with different athlete/sport populations.
Repeatable up to 3 credit hours.

KNES 6800. Directed Independent Study. (1 to 3) Directed study in areas of specialization in kinesiology and related fields. *Graded on a Pass/Unsatisfactory basis.*

KNES 6900. Research and Thesis in Kinesiology. (3)
Prerequisite(s): KNES 6115 and permission of instructor overseeing thesis research. Design, implementation, presentation, and evaluation of an approved research project in student's specialty area. The applied project is under the supervision of an advisor and graduate committee. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

KNES 7999. Master's Degree Graduate Residency Credit. (1) Meets Graduate School requirement for continuous enrollment during final term prior to graduation when all coursework has been completed.

Languages, Cultures and Translation (LANG)

LANG 5050. Topics in Foreign Language. (3) Selected topics in field of interest related to a variety of languages. *May be repeated at UNC Charlotte for credit with change of topic. May be repeated once for Study Abroad credit with change of topic.*

Latin American Studies (LTAM)

LTAM 5000. Graduate Topics in Latin American Studies. (3) Intensive treatment of a topic in Latin American Studies, depending on student needs and staff resources. *May be repeated for credit with change of topic.*

LTAM 5120. Advanced Business Spanish I. (3) Cross-listed Course(s): SPAN 5120. Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Advanced studies in Business Spanish, intensive practice in speaking, listening comprehension, reading, writing, and translation in functional business areas such as economics, management, and marketing.

LTAM 5121. Advanced Business Spanish II. (3) Cross-listed Course(s): SPAN 5121. Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, courses or permission of the department. Advanced studies in Business Spanish, intensive practice in speaking, listening comprehension,

reading, writing, and translation in functional business areas such as marketing, finance, and import-export.

LTAM 5310. Studies in Spanish American Poetry. (3) Cross-listed Course(s): SPAN 5210. Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Studies of 19th and 20th century Spanish American poetry.

LTAM 5311. Studies in Spanish American Prose Fiction. (3) Cross-listed Course(s): SPAN 5011. Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Studies of 19th and 20th century Spanish American prose fiction.

LTAM 5312. Studies in Spanish American Theater. (3) Cross-listed Course(s): SPAN 5212. Prerequisite(s): Permission of the department. Studies of 20th century Spanish American theater.

LTAM 5600. Seminar in Latin American Studies. (3) Cross-listed Course(s): LTAM 4600. A seminar involving in-depth research and analysis of a topic suitable for interdisciplinary study and exploration of a variety of methodological approaches. *May be repeated for credit with change of topic.*

LTAM 6000. Advanced Graduate Topics in Latin American Studies. (3) Intensive treatment of a topic in Latin American Studies, depending on student needs and staff resources. *May be repeated for credit with change of topic.*

LTAM 6100. Seminar in Latin American Politics. (3) An analysis of contemporary Latin American politics

LTAM 6250. Comparative Slavery and Race Relations. (3) Cross-listed Course(s): HIST 6250. Prerequisite(s): Permission of the department. Slavery in the New World through its abolition including Indian and African slaves, the slave trade, the economics of slavery, and the impact of slavery on modern race relations in the Americas.

LTAM 6251. Seminar in Colonial Latin American History. (3) Cross-listed Course(s): HIST 6201. Prerequisite(s): Permission of the department. A seminar devoted to selected themes in colonial Latin American history. Provides an introduction to research methods, documentary sources, and the critical analysis of historical literature. Topics will change. *May be repeated for credit.*

LTAM 6252. Seminar in Modern Latin American History. (3) Cross-listed Course(s): HIST 6202. Prerequisite(s): Permission of the department. A seminar devoted to selected themes in modern Latin American history. This course provides an introduction to research methods,

documentary sources, and the critical analysis of historical literature. Topics will change. *May be repeated for credit.*

LTAM 6300. Seminar in Latin American Thought. (3) An examination of Latin American thought from the Spanish Conquest to the present day. Emphasis on colonialism and post-colonialism as well as ethnic, racial, class, national, and gender identity

LTAM 6307. Advanced Studies in Spanish American Literature. (3) Cross-listed Course(s): SPAN 6007. Prerequisite(s): Permission of the department. Study of selected works, writers, literary genres, periods, and schools from Spanish America. *May be repeated for credit with change of topic.*

LTAM 6400. Internship. (1 to 3) Prerequisite(s): Permission of the department. Supervised work experience in Latin America or related to Latino/a and Latin American Studies issues in the Charlotte area, accompanied by a written project.

LTAM 6800. Directed Readings. (3) Prerequisite(s): prior written permission of instructor and Director of Latin American Studies. Coverage of topics through individually designed reading programs and scheduled conferences with a faculty member. *May be repeated for credit.*

LTAM 6801. Directed Research. (3) Prerequisite(s): prior written permission of instructor and Director of Latin American Studies. Investigation of a topic in Latin American Studies culminating in a research paper.

LTAM 6910. Thesis Tutorial. (3) Independent study with a faculty advisor chosen by the student to conduct research for the M.A. thesis.

LTAM 6920. Master's Thesis. (3) Preparation of the master's thesis under the supervision of the thesis committee. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term.*

LTAM 6950. Comprehensive Examination (3) Preparation for and completion of the comprehensive exam option of the M.A. in Latin American Studies based on a reading list compiled in consultation with three examiners from at least two different departments.

Mathematics Education (MAED)

MAED 5040. Topics in Mathematics Education, Intermediate. (1 to 6) Prerequisite(s): Permission of department. Major topics in mathematics education involving intermediate grades. *May be repeated for credit with change of topic.*

MAED 5070. Topics in Mathematics Education, Secondary. (1 to 6) Prerequisite(s): Permission of department. Major topics in mathematics education involving secondary education. *May be repeated for credit with change of topic.*

MAED 5104. Microcomputing for Teachers. (3) Prerequisite(s): working knowledge of college algebra and trigonometry, and permission of department. Introduction to basic computer concepts, to microcomputer systems, to the design and development of programs to assist instruction in mathematics and computer sciences. A programming language such as BASIC or LOGO will be used. Students integrate skills learned by selecting, designing and developing a specific project. (No prior experience with computer programming required.)

MAED 5105. Geometry for Teachers. (3) Prerequisite(s): MATH 2102 or permission of department. A study of the foundations of Euclidean geometry and a brief treatment of non-Euclidean geometry. Emphasis on learning activities and teaching techniques for teachers of mathematics K-12.

MAED 5141. Mathematics for the Intermediate School Teacher. (3) Prerequisite(s): MATH 2102 or permission of department. A study of the algebraic properties of the real numbers; functions, equations, inequalities and their graphs, activities and applications related to upper elementary and intermediate grades.

MAED 5252. Teaching Mathematics to Secondary School Learners. (3) Cross-listed Course(s): MAED 4252. Prerequisite(s): MDSK 5204 and MDSK 6162. Corequisite(s): FLED 5105. The initial teaching methods course for secondary school mathematics teachers. Focuses on secondary school mathematics and its relation to the K-12 curriculum. Topics include: the planning and implementation of high quality mathematics lessons with an emphasis on problem solving, mathematical connections, and communication, including school-based field experiences.

MAED 5232. Teaching Mathematics to Middle School Learners. (3) Prerequisite(s): Admission to the MAT Program (Middle Grades mathematics emphasis) or permission of department. Initial teaching methods course for middle school mathematics teachers. Focuses on secondary school mathematics and its relation to the K-12 curriculum. Topics include: the development of teaching strategies and activities in middle school mathematics with an emphasis on problem solving, mathematical connections, communication and assessment, including school-based field experiences.

MAED 6122. Theoretical Foundations of Learning Mathematics. (3) Cross-listed Course(s): EDCI 8122.

Prerequisite(s): Admission into the M.S. in Mathematics with Concentration in Mathematics Education program. Introduction to theories of learning that have influenced the teaching of mathematics in K-12. An overview of theories that have guided reforms in mathematics teaching; contemporary constructivist theories of mathematics learning.

MAED 6123. Research in Mathematics Education. (3)

Cross-listed Course(s): EDCI 8123. Prerequisite(s): Admission into the M.S. in Mathematics with Concentration in Mathematics Education program. An introduction and overview of research in the teaching and learning of mathematics in K-12. Overview of contemporary research perspectives and paradigms; interpreting and synthesizing the research literature; survey of contemporary research problems in mathematics teaching and learning; development of classroom-based research studies.

MAED 6124. Issues in the Teaching of Mathematics. (3)

Cross-listed Course(s): EDCI 8124. Prerequisite(s): Admission into the M.S. in Mathematics with Concentration in Mathematics Education program. Study of major issues affecting mathematics education: analysis of the impact of learning theories on methods of teaching; assessment methods for improving mathematics learning; analysis of the historical and programmatic development of the mathematics curriculum leading to current trends, issues, and problems; and analysis of the role of technology in the mathematics classroom.

MAED 6252. Advanced Methods in Middle and Secondary Mathematics Education. (3) Prerequisite(s):

Enrollment in the MAT or M.Ed. program. Examination of current research and scholarship on the teaching of mathematics in middle and secondary schools. Particular emphasis on the development of advanced instructional expertise and leadership.

MAED 8124. Advanced Topics in Mathematics Education. (3) Prerequisite(s):

Enrollment in the Mathematics Education specialization of the Ph.D. in Curriculum and Instruction program. Advanced research topics in the teaching and learning of mathematics. Includes a survey, interpretation, and synthesis of contemporary research problems in mathematics teaching and learning. *May be repeated for credit with change of topic.*

MAED 8160. Readings in Mathematics Education. (3)

Prerequisite(s): Enrollment in the Mathematics Education specialization of the Ph.D. in Curriculum and Instruction program. Readings in the teaching and learning of mathematics K-16; analysis of the historical development of the K-16 mathematics curriculum leading to current trends, issues, and problems; theory, methods, and techniques for assessment; and analysis of contemporary issues impacting the teaching of mathematics.

Mathematics (MATH)

MATH 5040. Topics in Analysis. (2 to 3) Prerequisite(s):

Permission of department. Topics in the foundations or the history of mathematics selected to supplement regular course offerings in this area of mathematics. *May be repeated for credit with permission of department.* Credit for the M.A. degree in mathematics requires approval of the department.

MATH 5080. Topics in Geometry and Topology. (3)

Prerequisite(s): Permission of department. Topics in geometry or topology selected to supplement regular course offerings in this area of mathematics. *May be repeated for credit with permission of department.* Credit for M.A. degree in mathematics requires approval of the department.

MATH 5109. History of Mathematical Thought. (3)

Prerequisite(s): MATH 1241 or permission of department. A study of the development of mathematics in its historical setting from the earliest beginnings to modern times. Not approved for the M.A. in mathematics degree.

MATH 5128. Applied Probability I. (3) Prerequisite(s):

MATH/STAT 3122 and MATH 2171 or permission of department. Finite and countable Markov chains, Markov Decision Processes, and optimal stopping. Other topics selected from: queuing theory, inventory models, reliability theory, game theory, recurrent events, information theory, stochastic control, stochastic control with incomplete information and Kalman filtering.

MATH 5129. Applied Probability II. (3) Prerequisite(s): MATH 5128 or permission of department. Continuation of MATH 5128.

MATH 5143. Analysis I. (3) Prerequisite(s): MATH 3141 with grade of B or above, or permission of department. First course of a two-semester sequence providing a rigorous treatment of continuity, differentiability, and integration of functions of one and several real variables.

MATH 5144. Analysis II. (3) Prerequisite(s): MATH 5143 with a grade of B or above or permission of department. Continuation of MATH 5143.

MATH 5161. Number Theory. (3) Prerequisite(s): MATH

3163 with a grade of C or above or permission of department. A study of the elements of classical number theory including divisibility, congruences, diophantine equations, prime numbers and their distribution, quadratic reciprocity, number-theoretic functions, and famous unsolved problems. Not approved for the M.A. in mathematics degree.

MATH 5163. Modern Algebra. (3) Prerequisite(s): MATH 3163 or permission of department. Groups, rings, integral domains, fields.

MATH 5164. Abstract Linear Algebra. (3) Prerequisite(s): MATH 3163 and 2164 or permission of department. Vector spaces over arbitrary fields, linear transformations, canonical forms, multilinear algebra.

MATH 5165. Numerical Linear Algebra. (3) Prerequisite(s): ITSC 1212 and MATH 2164, or permission of department. Cross-listed Course(s): MATH 4165. Matrix norms and condition numbers. Direct methods for linear systems and their accuracy and stability. Iterative methods for large sparse linear systems and their convergence. Least squares methods for non-square linear systems. Matrix Decompositions (LU and Cholesky Decompositions, Rank Decomposition, QR decomposition; Eigendecomposition and Diagonalization, Singular Value Decomposition). Efficient matrix multiplication methods. Matrix approximations. Matrix phylogeny. Examples of numerical linear algebra in machine learning.

MATH 5172. The Finite Element Method. (3) Prerequisite(s): ITCS 1214, MATH 2241, MATH 2164, and MATH 2171 with grades of C or above, or permission of department. Boundary value problems and their variational form. Finite element basis functions, computational techniques, isoparametric elements and curved boundaries, alternate methods, singular problems, eigenvalue problems. Some practical experience with an F.E.M. program and graphical output.

MATH 5173. Ordinary Differential Equations. (3) Prerequisite(s): MATH 2171 and MATH 3142, or permission of department. Existence and uniqueness theorems for initial value problems; continuous dependence of solutions on initial values and right hand sides; linear differential equations in $\mathbb{R}^2$ and $\mathbb{R}^n$; nonlinear differential equations in $\mathbb{R}^2$ and $\mathbb{R}^n$: phase portraits, singularities, cycles; invariant manifolds; linearization; singularities of planar systems; Lyapunov stability; examples: van der Pol oscillator, Liénard systems, Volterra-Lotka equations.

MATH 5174. Partial Differential Equations. (3) Prerequisite(s): MATH 2164, MATH 2171, and MATH 3141, or permission of department. Classification of types of partial differential equations. Separation of variables, Sturm-Liouville problems, boundary and eigenvalue problems, fundamental solutions and Green's theorem, Fourier series and integrals, Laplace transforms.

MATH 5175. Mathematical Foundations of Optimization (3) Prerequisite(s): ITSC 1212, MATH 2164, and MATH 2241, or permission of the department. Cross-listed Course(s): MATH 4175. Introduces the mathematical foundation of

optimization problems. The covered topics include basic elements of optimization theory and focus on unconstrained and constrained nonlinear optimization. Both mathematical analysis and coding skill training will be offered in this course.

MATH 5176. Numerical Methods for Partial Differential Equations. (3) Prerequisite(s): ITCS 1214, MATH 2241, MATH 2164, and MATH 2171, all with a grade of C or above, or permission of department. Basic finite difference schemes for the solutions of elliptic, parabolic and hyperbolic equations. Von Neumann analysis, characteristics, boundary conditions.

MATH 5181. Introduction to Topology. (3) Prerequisite(s): MATH 2164 with a grade of C or above. Topics from set theory and point set topology such as cardinality, order, topological spaces, metric spaces, separation axioms, compactness and connectedness.

MATH 5228. Life Insurance Mathematics. (3) Cross-listed Course(s): MATH 4228. Prerequisite(s): MATH 3122 or STAT 3122, and MATH 3228 with grades of B or above; or permission of department. Introduction to long-term insurance; survival distribution models, estimating mortality rates, long-term insurance coverages, annuities, premiums, and reserves.

MATH 5229. Advanced Life Insurance Mathematics. (3) Cross-listed Course(s): MATH 4229. Prerequisite(s): MATH 4228 or MATH 5228 with grade of C or above; or permission of department. Advanced Long-Term Insurance; multiple state mortality - Markov Chains, multiple decrements probabilities and insurance, multiple lives probabilities and insurance, pension plans and retirement benefits, profit testing.

MATH 5691. Seminar. (1 to 6) Cross-listed Course(s): MATH 4691. Prerequisite(s): Permission of department. Individual or group investigation and exposition of selected topics in mathematics. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

MATH 5692. Seminar. (1 to 6) Cross-listed Course(s): MATH 4692. Prerequisite(s): Permission of department. A continuation of MATH 5691. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

MATH 6004. Topics in Analysis. (3) Cross-listed Course(s): EDCI 8004. Prerequisite(s): Permission of department. Topics in analysis selected so as to complement regular course offerings in this area of mathematics. *May be repeated for credit with permission of department.*

MATH 6050. Topics in Mathematics. (3) Prerequisite(s): Permission of department. Topics chosen from applied mathematics applicable to other disciplines.

MATH 6101. Foundations of Mathematics. (3) Cross-listed Course(s): EDCI 8101. Prerequisite(s): Permission of department. Introduces the fundamentals of set theory and logic. Topics include: theorem proving, sets, functions, relations, and constructing number systems.

MATH 6102. Real Analysis for Mathematics Teachers. (3) Cross-listed Course(s): EDCI 8102. Prerequisite(s): MATH 6101 and permission of department. A theoretical understanding of the basics of real analysis. Topics include: limits and continuity, derivatives, integrals, and Taylor series.

MATH 6103. Computer Techniques and Numerical Methods. (3) Cross-listed Course(s): EDCI 8103. Prerequisite(s): Permission of department. Computer systems, programming, and the computer solution of numerical problems.

MATH 6105. Problem Solving in Discrete Mathematics. (3) Prerequisite(s): Permission of department. Propositional and predicate calculus, counting techniques, partially ordered sets, lattices, graphs and trees.

MATH 6106. Modern Algebra for Mathematics Teachers. (3) Cross-listed Course(s): EDCI 8106. Prerequisite(s): MATH 3163 or its equivalent or permission of department. Topics chosen from group theory, rings and ideals, integral domains, fields and elementary Galois theory.

MATH 6107. Linear Algebra for Mathematics Teachers. (3) Cross-listed Course(s): EDCI 8107. Prerequisite(s): MATH 2164 or its equivalent or permission of department. Systems of linear equations, matrices, vector spaces, linear transformations, determinants, canonical forms of matrices, inner products.

MATH 6108. Probability and Statistics for Mathematics Teachers. (3) Cross-listed Course(s): STAT 6108. Prerequisite(s): Admission into the M.S. in Mathematics with Concentration in Mathematics Education program. Topics from probability and statistics appropriate for mathematics teachers. Topics in probability include: discrete and continuous random variables, probability distributions, sums and functions of random variables, the law of large numbers, and the central limit theorem. Topics in statistics include: sample mean and variance, estimating distributions, correlation, regression, and hypothesis testing.

MATH 6118. Non-Euclidean Geometry. (3) Cross-listed Course(s): EDCI 8118. Prerequisite(s): Permission of department. History of Euclid's Fifth Postulate and attempts to prove it; work of Gauss, Bolyai, Lobachevsky and

others; systematic development of hyperbolic geometry; relative consistency of hyperbolic geometry; relative consistency of hyperbolic and Euclidean geometries.

MATH 6171. Advanced Applied Mathematics I. (3) Prerequisite(s): MATH 2241 and MATH 2171 with grades of C or above, or permission of department. Power series solutions of ordinary differential equations, vector calculus, line and surface integrals, partial differential equations and Fourier integrals.

MATH 6172. Advanced Applied Mathematics II. (3) Prerequisite(s): MATH 2241 and MATH 2171 with grades of C or above, or permission of department. Complex analysis; probability and statistics.

MATH 6201. Statistical Techniques in Finance. (3) This course reviews basic concepts and introduces more advanced techniques from Probability and Statistics which are commonly utilized in mathematical finance. Topics covered include random variables, distributions, conditional expectations, confidence intervals and hypothesis testing, simple and multiple regression, multivariate analysis including factor and canonical correlation analysis, and time series models including ARMA, ARIMA, ARCH, and GARCH.

MATH 6202. Derivatives II: Partial Differential Equations for Finance. (3) This course deals with those partial differential equations which are associated with financial derivatives based on factors such as equities and spot interest rates.

MATH 6203. Stochastic Calculus for Finance I. (3) Prerequisite(s): Admission to the graduate program and permission of Program Director. This course starts with the probability theory in discrete probability space, discrete-time stochastic processes, and derivatives pricing in the Binomial model. The second part covers probability theory in general probability space and continuous-time martingale and Markov processes. Topics include: the Itô integral, Black-Scholes model, Itô-Doeblin formula, Girsanov's theorem, and Martingale Representation theorem. Applications to pricing of exotic derivatives and American options are discussed.

MATH 6204. Computational Methods for Asset Pricing. (3) Discusses and implements pricing methods for numerous derivatives under a variety of models. It reviews common processes for modeling assets in different markets and then examines many computational approaches for pricing derivatives. These include transform techniques, such as the fast Fourier transform, the fractional fast Fourier transform, the Fourier-cosine method, and the saddle-point method; the finite difference method for solving partial differential equations (PDEs); and Monte Carlo simulation. Model calibration for real-world derivative pricing is also discussed.

MATH 6205. Financial Computing. (3) This lab-oriented course introduces the numerical methods needed for quantitative work in finance, focusing on derivative pricing and fixed income applications. Topics include: binomial and trinomial methods, Crank-Nicholson methods for various exotic options, treatment of discrete dividends, numerical methods for stochastic differential equations, random number generators, Monte-Carlo methods for European and American options. The computing course teaches theory and practice of numerical finance as well as the programming skills needed to build software systems in C/C++, Java, Javascript, and Mathematica/Matlab.

MATH 6206. Stochastic Calculus for Finance II. (3) Cross-listed Course(s): MATH 8206. Prerequisite(s): MATH 6203 or permission of department. The applications of stochastic calculus techniques to advanced financial modeling. Topics include: pricing of European, American, and fixed-income derivatives in the Black-Scholes and stochastic volatility models. The Jump-diffusion model is also introduced.

MATH 6690. Graduate Teaching Assistant Training. (1) Prerequisite(s): Permission of department. Discusses techniques used in the teaching of mathematics and statistics. This course is required as a condition of employment for new graduate teaching and instructional assistants in the department.

MATH 7028. Topics in Probability. (3) Prerequisite(s): MATH 7120 and MATH 7121, or permission of department. Topics of current interest in probability and advanced topics in probability. *May be repeated for credit with permission of department.*

MATH 7050. Topics in Mathematics. (2 to 3) Prerequisite(s): Permission of department. Topics chosen from such fields as algebra, topology, analysis, applied mathematics, differential geometry, mathematical physics, graph theory, probability, statistics. *May be repeated for credit with change of topic and with the approval of the department.*

MATH 7065. Topics in Applied Algebra and Algebraic Structures. (3) Prerequisite(s): Permission of department. Current topics in Applied Algebra and Algebraic Structure.

MATH 7070. Topics in Numerical Analysis. (3) Prerequisite(s): Permission of department. Topics of current interest in numerical analysis. *May be repeated for credit with permission of department.*

MATH 7071. Topics in Differential Equations. (3) Prerequisite(s): Permission of department. Topics of current interest in ODE, PDE, dynamical systems, inverse problems

and related subjects. *May be repeated for credit with permission of department.*

MATH 7120. Probability Theory I. (3) Prerequisite(s): MATH 7143 and MATH/STAT 3122, or permission of department. Topics include: probability spaces, probability measures, sigma-algebras, characteristic functions, sequences of random variables, law of large numbers, general forms of the Central Limit Theorem.

MATH 7121. Probability Theory II. (3) Prerequisite(s): MATH 7120 or permission of department. A continuation of MATH 7120.

MATH 7125. Stochastic Processes I. (3) Prerequisite(s): MATH 3122, MATH 7120, and MATH 7143, or permission of department. Basic ideas in the study of stochastic processes, selected from: discrete and continuous time Markov processes, stationary and renewal processes, applications to queuing theory, reliability theory, stochastic differential equations, time-series analysis, filtering and stochastic control theory.

MATH 7126. Stochastic Processes II. (3) Prerequisite(s): MATH 7125. A continuation of MATH 7125.

MATH 7141. Complex Analysis I. (3) Prerequisite(s): MATH 5143 or permission of department. Holomorphic functions, complex integration, residues, entire and meromorphic functions, conformal mapping, harmonic functions.

MATH 7143. Real Analysis I. (3) Prerequisite(s): MATH 5144 or permission of department. Lebesgue integration on the real line, L_p spaces, introduction to general measure and integration theory.

MATH 7144. Real Analysis II. (3) Cross-listed Course(s): MATH 8144. Prerequisite(s): MATH 7143 or permission of department. An introduction to linear functional analysis. Topics include: normed linear spaces, bounded linear operators, Banach spaces, duality for normed linear spaces, weak convergence, Hilbert spaces, and compact self-adjoint operators.

MATH 7147. Applied Functional Analysis. (3) Prerequisite(s): MATH 5144. Introduction to functional analysis and its applications to such areas as linear and nonlinear differential equations, integral equations, and control theory. Topics chosen from Banach spaces, operators, the Hahn-Banach, open mapping and closed graph theorems, Sobolev spaces, spectral theory, operators in Hilbert space.

MATH 7148. Functional Analysis. (3) Prerequisite(s): MATH 7144 or permission of department. Material selected from: spectral theory, spectral theory of differential operators, groups and semigroups of operators, nonlinear functional

analysis, asymptotic analysis, integral equations, Fourier analysis, distributions, and Sobolev spaces.

MATH 7163. Modern Algebra I. (3) Prerequisite(s): MATH 4163 and MATH 4164, or permission of department. Topics include: Galois theory, commutative algebra, modules, ring theory, homological algebra.

MATH 7164. Modern Algebra II. (3) Prerequisite(s): MATH 7163. A continuation of MATH 7163.

MATH 7172. Partial Differential Equations. (3) Prerequisite(s): MATH 5174 and MATH 7144, or permission of department. Harmonic functions, mean-value theorem, maximum principle, Green's representation for the solution of the Dirichlet problem for Laplace's equation; Poisson's equations and the Poisson formula; statement and proof of the existence theorem for general second-order elliptic operators, generalized maximum principles; Sobolev spaces. Evolution equations involving elliptic operators, such as the heat or wave equations, may also be introduced.

MATH 7175. Inverse Problems. (3) Prerequisite(s): MATH 5174 and MATH 7144, or permission of department. Ill-posed problems and numerical methods for them. Applications of inverse problems to real processes. One dimensional inverse problems. Multi-dimensional inverse problems: uniqueness and numerical methods. Inverse scattering problems.

MATH 7176. Advanced Numerical Analysis. (3) Prerequisite(s): MATH 2164, MATH 2171, and MATH 5176, or permission of department. A selection of topics from such areas as iterative methods of solving linear and nonlinear systems of equations, approximation theory, splines, and finite element methods for partial differential equations.

MATH 7177. Applied Optimal Control. (3) Prerequisite(s): MATH 5143 or permission of department. Examples of control systems and optimization problems, optimal control of discrete-time systems, solutions of the general discrete-time optimization problem, optimal control of continuous-time systems, the calculus of variations, solution of the general continuous optimization problem, applications of the Pontryagin Maximum Principle, Dynamic programming, and Bang-bang control. Controllability and differential games may also be introduced.

MATH 7181. Topology I. (3) Prerequisite(s): Permission of department. Topological spaces, continuous functions, connectedness, compactness, and metrizability, and further topics from point-set, geometric or algebraic topology.

MATH 7182. Topology II. (3) Prerequisite(s): MATH 7181. A continuation of MATH 7181.

MATH 7184. Differential Geometry I. (3) Prerequisite(s): Permission of department. Manifolds, differential structures, tangent bundles, embeddings, immersions, inverse function theorem, Morse-Sard theorem, transversality, Borsuk-Ulam theorem, vector bundles, Euler characteristics, Morse theory, Stokes theorem, Gauss-Bonnet theorem, Whitney embedding theorem.

MATH 7273. Advanced Finite Element Analysis. (3) Prerequisite(s): MATH 5172 and MATH 5174, or permission of department. Selection of topics from such areas of finite element analysis as convergence theorems (Ciarlet), hierarchical basis functions, the h-p method, adaptive grid techniques and solution methods for nonlinear equations.

MATH 7275. Dynamical Systems I. (3) Prerequisite(s): MATH 5143 and MATH 5173, or permission of department. Cycles and separatrix cycles, Poincaré first-return map: diffeomorphisms, Poincaré-Bendixson Theory, flows on the two-torus; structural stability, genericity, Peixoto's theorem; singularities of planar systems. Degenerate singularities, Hopf bifurcation, saddle-node bifurcation, center bifurcation.

MATH 7276. Dynamical Systems II. (3) Prerequisite(s): MATH 7275 or permission of department. Method of averaging, Melnikov functions, hyperbolic structure, symbolic dynamics, homoclinic and heteroclinic orbits, global bifurcations, infinite dimensional dynamical systems, inertial manifolds, Lyapunov exponents and dimension of attractors, codimension-two bifurcations, Duffing's equation, Lorenz equations, finite dimensional systems of dimension at least three.

MATH 7490. Industrial Internship. (0 to 6) Prerequisite(s): completion of 6 credit hours of coursework in MATH/STAT/OPRS graduate courses and permission of department. Full- or part-time academic year or summer internship in mathematics and/or statistics complementary to the student's major course of study and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by the department's Graduate Program Director. Requires a mid-term report and final report to be graded by the supervising faculty. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit up to 6 credit hours. Credit hours gained from the internship may not be counted toward the courses leading to advancement to candidacy.*

MATH 7891. Independent Study in Mathematics. (1 to 3) Prerequisite(s): Permission of department. Faculty-directed independent study of topics not provided by other course offerings and/or to examine, extend, and enrich extant

knowledge in mathematics through supervised individual study. *May be repeated for credit with change of topic.*

MATH 7892. Directed Project in Mathematics. (1 to 3)

Prerequisite(s): Permission of department. The directed independent project may be original work, work of an expository nature, or the mathematical formulation and solution of a particular problem of mathematical significance. The project may also involve a specific application of techniques identified in the literature or studied in other courses. The project must be defended in an oral presentation. *May be repeated for credit up to 6 credit hours.*

MATH 7994. Master's Thesis. Research. (3)

Prerequisite(s): Permission of department. Subject to the approval of the department Graduate Committee, the thesis may be original work, work of an expository nature, or the mathematical formulation and solution of a particular industrial or business problem suggested by the career interests of the student. The thesis must be defended in an oral presentation. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit up to 6 credit hours.*

MATH 8028. Topics in Probability. (3) Prerequisite(s): MATH 8120 and MATH 8121, or permission of department. Topics of current interest in probability and advanced topics in probability. *May be repeated for credit with permission of department.*

MATH 8050. Topics in Mathematics. (2 to 3)

Prerequisite(s): Permission of department. Topics chosen from such fields as algebra, topology, analysis, applied mathematics, differential geometry, mathematical physics, graph theory, probability, statistics. *May be repeated for credit with change of topic and with the approval of the department.*

MATH 8065. Topics in Applied Algebra and Algebraic Structures. (3)

Prerequisite(s): Permission of department. Current topics in Applied Algebra and Algebraic Structure.

MATH 8070. Topics in Numerical Analysis. (3)

Prerequisite(s): Permission of department. Topics of current interest in numerical analysis. *May be repeated for credit with permission of department.*

MATH 8071. Topics in Differential Equations. (3)

Prerequisite(s): Permission of department. Topics of current interest in ODE, PDE, dynamical systems, inverse problems and related subjects. *May be repeated for credit with permission of department.*

MATH 8120. Probability Theory I. (3) Prerequisite(s): MATH 8143 and MATH/STAT 3122, or permission of department.

Topics include: probability spaces, probability measures, sigma-algebras, characteristic functions, sequences of random variables, law of large numbers, general forms of the Central Limit Theorem.

MATH 8121. Probability Theory II. (3) Prerequisite(s): MATH 8120 or permission of department. A continuation of MATH 8120.

MATH 8125. Stochastic Processes I. (3) Prerequisite(s): MATH 3122, MATH 8120, and MATH 8143, or permission of department. Basic ideas in the study of stochastic processes, selected from: discrete and continuous time Markov processes, stationary and renewal processes, applications to queuing theory, reliability theory, stochastic differential equations, time-series analysis, filtering and stochastic control theory.

MATH 8126. Stochastic Processes II. (3) Prerequisite(s): MATH 8125. A continuation of MATH 8125.

MATH 8141. Complex Analysis I. (3) Prerequisite(s): MATH 5143 or permission of department. Holomorphic functions, complex integration, residues, entire and meromorphic functions, conformal mapping, harmonic functions.

MATH 8143. Real Analysis I. (3) Prerequisite(s): MATH 5144 or permission of department. Lebesgue integration on the real line, L_p spaces, introduction to general measure and integration theory.

MATH 8144. Real Analysis II. (3) Cross-listed Course(s): MATH 7144. Prerequisite(s): MATH 7143, MATH 8143, or permission of department. An introduction to linear functional analysis. Topics include: normed linear spaces, bounded linear operators, Banach spaces, duality for normed linear spaces, weak convergence, Hilbert spaces, and compact self-adjoint operators.

MATH 8147. Applied Functional Analysis. (3) Prerequisite(s): MATH 5144. Introduction to functional analysis and its applications to such areas as linear and nonlinear differential equations, integral equations, and control theory. Topics chosen from Banach spaces, operators, the Hahn-Banach, open mapping and closed graph theorems, Sobolev spaces, spectral theory, operators in Hilbert space.

MATH 8148. Functional Analysis. (3) Prerequisite(s): MATH 8144 or permission of department. Material selected from: spectral theory, spectral theory of differential operators, groups and semigroups of operators, nonlinear functional analysis, asymptotic analysis, integral equations, Fourier analysis, distributions, and Sobolev spaces.

MATH 8163. Modern Algebra I. (3) Prerequisite(s): MATH 4163 and MATH 4164 or permission of department. Topics

selected from Galois theory, commutative algebra, modules, ring theory, homological algebra.

MATH 8164. Modern Algebra II. (3) Prerequisite(s): MATH 8163. A continuation of MATH 8163.

MATH 8172. Partial Differential Equations. (3) Prerequisite(s): MATH 5174 and MATH 8144, or permission of department. Harmonic functions, mean-value theorem, maximum principle, Green's representation for the solution of the Dirichlet problem for Laplace's equation; Poisson's equations and the Poisson formula; statement and proof of the existence theorem for general second-order elliptic operators, generalized maximum principles; Sobolev spaces. Evolution equations involving elliptic operators, such as the heat or wave equations, may also be introduced.

MATH 8175. Inverse Problems. (3) Prerequisite(s): MATH 5174 and MATH 8144, or permission of department. Ill-posed problems and numerical methods for them. Applications of inverse problems to real processes. One dimensional inverse problems. Multi-dimensional inverse problems: uniqueness and numerical methods. Inverse scattering problems.

MATH 8176. Advanced Numerical Analysis. (3) Prerequisite(s): MATH 2164, MATH 2171, and MATH 5176, or permission of department. A selection of topics from such areas as iterative methods of solving linear and nonlinear systems of equations, approximation theory, splines, and finite element methods for partial differential equations.

MATH 8177. Applied Optimal Control. (3) Prerequisite(s): MATH 5143 or permission of department. Examples of control systems and optimization problems, optimal control of discrete-time systems, solutions of the general discrete-time optimization problem, optimal control of continuous-time systems, the calculus of variations, solution of the general continuous optimization problem, applications of the Pontryagin Maximum Principle, Dynamic programming, and Bang-bang control. Controllability and differential games may also be introduced.

MATH 8181. Topology I. (3) Prerequisite(s): Permission of department. Topological spaces, continuous functions, connectedness, compactness, and metrizability, and further topics from point-set, geometric or algebraic topology.

MATH 8182. Topology II. (3) Prerequisite(s): MATH 8181. A continuation of MATH 8181.

MATH 8184. Differential Geometry I. (3) Prerequisite(s): Permission of department. Manifolds, differential structures,

tangent bundles, embeddings, immersions, inverse function theorem, Morse-Sard theorem, transversality, Borsuk-Ulam theorem, vector bundles, Euler characteristics, Morse theory, Stokes theorem, Gauss-Bonnet theorem, Whitney embedding theorem.

MATH 8202. Partial Differential Equations for Finance. (3) Cross-listed Course(s): MATH 6202. This course deals with those partial differential equations which are associated with financial derivatives based on factors such as equities and spot interest rates.

MATH 8203. Stochastic Calculus for Finance. (3) Cross-listed Course(s): MATH 6203. An introduction to those aspects of partial differential equations and diffusion processes most relevant to finance, Random walk and first-step analysis, Markov property, martingales and semi-martingales, Brownian motion. Stochastic differential equations: Ito's lemma, backward and forward Kolmogorov equations, the Feynman-Kac formula, stopping times, Hull and White Models, Cox-Ingersoll-Ross Model. Applications to finance including portfolio optimization and option pricing.

MATH 8204. Computational Methods for Asset Pricing. (3) Cross-listed Course(s): MATH 6204. Discusses and implements pricing methods for numerous derivatives under a variety of models. It reviews common processes for modeling assets in different markets and then examines many computational approaches for pricing derivatives. These include transform techniques, such as the fast Fourier transform, the fractional fast Fourier transform, the Fourier-cosine method, and the saddle-point method; the finite difference method for solving partial differential equations (PDEs); and Monte Carlo simulation. Model calibration for real-world derivative pricing is also discussed.

MATH 8206. Stochastic Calculus for Finance II. (3) Cross-listed Course(s): MATH 6206. Prerequisite(s): MATH 8203 or permission of department. The applications of stochastic calculus techniques to advanced financial modeling. Topics include: pricing of European, American, and fixed-income derivatives in the Black-Scholes and stochastic volatility models. The Jump-diffusion model is also introduced.

MATH 8273. Advanced Finite Element Analysis. (3) Prerequisite(s): MATH 5172 and MATH 5174, or permission of department. Selection of topics from such areas of finite element analysis as convergence theorems (Ciarlet), hierarchical basis functions, the h-p method, adaptive grid techniques and solution methods for nonlinear equations.

MATH 8275. Dynamical Systems I. (3) Prerequisite(s): MATH 5143 and MATH 5173, or permission of department. Cycles and separatrix cycles, Poincaré first-return map:

diffeomorphisms, Poincaré-Bendixson Theory, flows on the two-torus; structural stability, genericity, Peixoto's theorem; singularities of planar systems. Degenerate singularities, Hopf bifurcation, saddle-node bifurcation, center bifurcation.

MATH 8276. Dynamical Systems II. (3) Prerequisite(s): MATH 8275 or permission of department. Method of averaging, Melnikov functions, hyperbolic structure, symbolic dynamics, homoclinic and heteroclinic orbits, global bifurcations, infinite dimensional dynamical systems, inertial manifolds, Lyapunov exponents and dimension of attractors, codimension-two bifurcations, Duffing's equation, Lorenz equations, finite dimensional systems of dimension at least three.

MATH 8490. Industrial Internship. (0 to 6) Prerequisite(s): completion of 6 credit hours of coursework in MATH/STAT/OPRS graduate courses and permission of department. Full- or part-time academic year or summer internship in mathematics and/or statistics complementary to the student's major course of study and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by the department's Graduate Program Director. Requires a mid-term report and final report to be graded by the supervising faculty. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit up to 6 credit hours. Credit hours gained from the internship may not be counted toward the courses leading to advancement to candidacy.*

MATH 8891. Independent Study in Mathematics. (1 to 3) Prerequisite(s): Permission of department. Faculty-directed independent study of topics not provided by other course offerings and/or to examine, extend, and enrich extant knowledge in mathematics through supervised individual study. *May be repeated for credit with change of topic.*

MATH 8892. Directed Project in Mathematics. (1 to 3) Prerequisite(s): Permission of department. The directed independent project may be original work, work of an expository nature, or the mathematical formulation and solution of a particular problem of mathematical significance. The project may also involve a specific application of techniques identified in the literature or studied in other courses. The project must be defended in an oral presentation. *May be repeated for credit up to 9 credit hours.*

MATH 8994. Doctoral Research and Reading. (0 to 9) Prerequisite(s): Permission of department. Investigation of a topic in mathematics culminating in a research paper. *May be repeated for credit.*

MATH 8999. Doctoral Dissertation Research. (1) Prerequisite(s): Advancement to Candidacy. Individual

investigation and research leading to the preparation of a doctoral dissertation. *May be repeated for credit.*

Master of Business Administration (MBAD)

MBAD 5110. Foundation of Economics. (3) Prerequisite(s): Enrollment in MBA or Graduate Certificate program. Focuses on topics related to the scope and methodology of economics as a social science, the analysis of markets, the development of market structure, the characteristics of market failure, problems of economic concentration, the measurement of national income, the theory of national income determination, money and banking, monetary and fiscal policy, international economics and the theory of income distribution.

MBAD 5121. Business Information Systems. (3) Prerequisite(s): Enrollment in MBA or Graduate Certificate program, and basic computer knowledge and skills. Examination of how information systems are developed and used in organizations, how information resources are managed, and the potential strategic and competitive impact information systems have in domestic and global business environments.

MBAD 5131. Fundamentals of Financial Accounting and Financial Management. (3) Prerequisite(s): Enrollment in MBA or Graduate Certificate program. Accelerated and in-depth study of conceptual foundations and applications of financial accounting and financial management with emphasis on building accounting and finance information bases for external decision making. (Accounting and finance preparation to enter the MBA. May not be taken for credit toward any undergraduate degree within the Belk College of Business or used as equivalent credit for ACCT 2121-2122).

MBAD 5141. Business Statistics and Quantitative Analysis. (3) Prerequisite(s): Enrollment in MBA or Graduate Certificate program. Designed to bring MBA students up to an acceptable level of analytical capability in the areas of probability theory, business statistics, basic linear mathematics (algebra and matrix algebra) and basic differential and integral calculus.

MBAD 5158. Student Managed Investment Fund I. (0 to 3) Cross-listed Course(s): FINN 5158. Prerequisite(s): MBAD 5159, FINN 3120 or MBAD 6152, FINN 3222 or FINN/MBAD 6153, and permission of instructor. Management of an actual portfolio consisting of a portion of the University's Endowment Fund.

MBAD 5159. Student Managed Investment Fund II. (0 to 3)
Cross-listed Course(s): FINN 5159. Prerequisite(s): MBAD 5158, FINN 3120 or MBAD 6152, FINN 3222 or FINN/MBAD 6153, and permission of instructor. Management of an actual portfolio consisting of a portion of the University's Endowment Fund.

MBAD 5191. Legal Environment in Business. (1)
Prerequisite(s): enrollment in MBA program. Legal environment in which business operates today; Legal, social, and ethical considerations of managers within the framework of federal and state regulatory laws; role and function of federal regulatory agencies and their impact on business activities.

MBAD 5300. Entrepreneurial Decisions. (0 to 3) Cross-listed Course(s): MGMT 4300. Examines the important decisions that entrepreneurs make in forming new ventures, from founding a venture as an individual versus a team, to growth: how much and how fast, to self-financing versus debt versus equity, to rules: playing by them versus setting them.

MBAD 6101. Ethical Leadership. (0 to 3) Prerequisite(s): Enrollment in the MBA Program. Examination of the roles of organizational values, culture, leadership, and governance in the avoidance of misconduct and in the development and maintenance of ethical organizations. Emphasis is placed on individual ethical decision-making challenges in organizations and on the development of ethical leadership skills.

MBAD 6112. The Economics of Business Decisions. (0 to 3)
Prerequisite(s): MBAD 5110 and MBAD 5141, or equivalents. Economic concepts in the decision-making process. Topics include: scarcity; marginal analysis and tools of optimization; demand and supply analysis and market structure; economic efficiency; regression analysis; risk analysis and game theory; and international issues.

MBAD 6122. Decision Modeling and Analysis. (0 to 3)
Cross-listed Course(s): DSBA 6122. Prerequisite(s): MBAD 5141 or equivalent. An analytical approach to the management process. Generalized models for decision making with major emphasis on application of the scientific method to management problems.

MBAD 6131. Financial and Managerial Accounting for MBAs. (0 to 3) Prerequisite(s): MBAD 5131 or equivalent. Analyzing financial statements and using accounting information for strategic, tactical, and operating decisions with a focus on strategic cost management. Emphasis is on using cost and other management accounting information in making sound decisions, its effect on managerial behavior, and its use in formulating and implementing strategy, and issues of design and operation of management control systems including the intended

and unintended consequences of performance measurement.

MBAD 6141. Operations Management. (0 to 3)
Prerequisite(s): MBAD 5141 or equivalent. Design, operation, and control of service and manufacturing systems. Emphasis on using analytical tools for problem solving in process analysis and re-engineering, work-force management, material and inventory management, aggregate planning, total quality management, and others.

MBAD 6150. Foundations of FinTech. (3) Prerequisite(s): MBAD 6152 or MSRE 6152 or Enrollment in MBA/Graduate Certificate Program and Permission of Instructor. An overview of fintech topics and how technology is changing the landscape of financial services. Students will learn about the latest trends and developments in payments, lending, wealth management, and blockchain and gain an understanding of the opportunities and challenges facing fintech startups and established financial institutions alike.

MBAD 6151. Financial Institutions and Markets. (0 to 3)
Cross-listed Course(s): FINN 6151. Prerequisite(s): MBAD 6152. Major financial institutions, particularly commercial banks, and their role in the intermediation process and as suppliers of funds to the money and capital markets. Comparative financial policies of these institutions are examined in the context of their legal and market environment.

MBAD 6152. Financial Management. (0 to 3) Cross-listed Course(s): FINN 6152 and MSRE 6152. Prerequisite(s): MBAD 6112 and MBAD 6131. Theory and practice of corporate finance including asset management, cost of capital and capital budgeting, optimization problems and socio-economic aspects of financial management. Computer technology may be employed when applicable.

MBAD 6153. Investment Management. (0 to 3) Cross-listed Course(s): FINN 6153. Prerequisite(s): MBAD 6152. Theory and practice of investment decisions of individuals and fund managers. Topics include: the status of capital market theory, the efficient market hypothesis literature, and a portfolio performance measurement. Standard institutional and investment analysis topics, futures and options markets, and international investment topics are covered.

MBAD 6154. Applied Business Finance. (0 to 3) Cross-listed Course(s): FINN 6154. Prerequisite(s): MBAD 6152. Examination of business finance topics which typically confront the firm's primary finance functional areas (CFO, Treasurer, Controller). The purpose is to develop advanced analytical skills in those topic areas. The following topics form the basis of the course: lease vs buy (borrow); leveraged buy-outs; merger analysis (emphasis on

valuation); international operations of American firms (capital budgeting and cost of capital); capital structure; risk management. Such additional topics as working capital management; risk management; and relevant current topics will be included as time permits.

MBAD 6155. Multinational Financial Management. (0 to 3)

Cross-listed Course(s): FINN 6155. Prerequisite(s): MBAD 6152. Financial management of the multinational firm including management of foreign exchange risk and political risk, and the control and evaluation of financial policies of multinational firms.

MBAD 6156. Commercial Bank Management. (0 to 3)

Cross-listed Course(s): FINN 6156. Prerequisite(s): MBAD 6152. Techniques for the management of commercial banks. Topics of study include industry structure, administrative organization, management of assets, liabilities, and capital, and financial analysis of the banking firm.

MBAD 6157. Advanced Corporate Finance. (0 to 3)

Cross-listed Course(s): FINN 6157. Prerequisite(s): MBAD 6152. Theories of modern corporate finance, including theory of efficient capital markets; uncertainty and the theory of choice; market equilibrium asset pricing models (capital asset pricing model, arbitrage pricing theory, Black-Scholes); theories of capital structure and the cost of capital; dividend policy; and leasing.

MBAD 6158. Real Estate Finance and Investment. (0 to 3)

Cross-listed Course(s): MSRE 6158. Prerequisite(s): MBAD 6152. Focuses on the techniques used to analyze, finance and structure real estate transactions. Topics include: an overview of the real estate space and capital markets; the techniques of financial analysis; project ownership, taxation and financial structure; determining the financial feasibility of real estate development; and corporate real estate strategies.

MBAD 6159. Real Estate Development. (0 to 3)

Cross-listed Course(s): MSRE 6159. An introduction to the real estate development process. Identification and evaluation of the critical assumptions and issues related to market and site feasibility, financial feasibility, planning, acquisition, construction, and operation of economically viable commercial real estate projects. Students work in groups on a semester project to select a site and prepare an appropriate development plan that emphasizes the market and financial feasibility of the real estate development.

MBAD 6160. Real Estate Capital Markets. (0 to 3)

Cross-listed Course(s): MSRE 6160. Prerequisite(s): MBAD 6152. The techniques used to analyze, finance and structure real estate transactions, and emphasizes the role of the capital markets in facilitating development and investment in commercial real estate. Topics include: real estate in an

investment portfolio; valuation and investment analysis for direct (private) real estate equity investment including coverage of valuation using real option methodology; primary and secondary commercial mortgage markets (CMBS); and, analysis of publicly traded equity real estate investment trusts (REITs).

MBAD 6161. Human Behavior in Organizations. (0 to 3)

Behavioral knowledge and skills essential to becoming an effective manager/leader including behavior and motivation in an environment of complexity and rapid change and ethical implications of actions and their effects on demographically diverse and increasingly international work force.

MBAD 6163. Managing People for Competitive Advantage. (0 to 3)

Prerequisite(s): MBAD 6161. An examination of the current critical issues and strategic questions associated with managing employees. Case material, readings, and audiovisual material are used to stimulate discussion of the most important and strategic questions to be tackled by general managers today and in the future in the relationship between management and workers.

MBAD 6164. Executive Communication. (0 to 3)

Intensive study of communication in organizations from middle and upper management perspectives with special attention to corporate communication, media relations, technologically mediated communication, crisis communication and public affairs. Case studies, readings, and project assignments are used in a variety of business situations.

MBAD 6165. Negotiation and Conflict Management. (0 to 3)

Negotiation is the art and science of securing agreement between two or more independent parties. Conflict management involves resolving situations where the interests of two or more parties differ. Involves developing a repertoire of skills and techniques for negotiation and conflict management to develop a systematic and positive approach for negotiating with multiple stakeholders. Case studies, readings, and simulations are used.

MBAD 6191. Entrepreneurial Strategy. (0 to 3)

Prerequisite(s): MBAD 6131, MBAD 6152, MBAD 6270, or permission of the MBA Program Director. An examination of entrepreneurship and entrepreneurs. Focus on planning the start-up of a fast-growth enterprise with the aim of rewarding the founders and initial investors with significant capital gains. Extensive use of case studies provide a background of classroom activities to assist students in the preparation of a detailed plan for the hypothetical start-up of a fast-growth firm.

MBAD 6193. Global Business Environment. (0 to 3)

Prerequisite(s): MBAD 6152, MBAD 6270, or permission of

the MBA Program Director. An overview of international business management. Specifically, the functional areas of business are covered to provide an international perspective.

MBAD 6194. Global Strategic Management. (0 to 3)

Prerequisite(s): All courses in the primary and intermediate block of the Functional Component or permission of the Director of the MBA program. Examination of the need to integrate the functional activities of the firm in planning corporate objectives and achieving operating results. Emphasis on ability to identify issues and problems of the firm as a whole, to explore alternatives and to make decisions which recognize the interrelationships of the functional specialties within the total organization. Application and integration of knowledge and skills of analysis developed in the preceding courses of the MBA program.

MBAD 6197. International Business Management. (0 to 3)

Prerequisite(s): MBAD 6270 and one of the following: MBAD 5300, MBAD 6191, MBAD 6302, MBAD 6304, MBAD 6305, MBAD 6306, or MBAD 6309; or permission of instructor. Experiential learning for early-to mid-career management professionals that have some prior exposure to international business transactions but hope to gain current knowledge and hands-on experiences into a more responsible position in international business development. The focus of learning is on the changing and diverse international business environment, and the discovery and strategic management of opportunities and threats.

MBAD 6201. Business Intelligence and Analytics. (0 to 3)

Prerequisite(s): MBAD 5121 or equivalent. An overview of the business approach to identifying, modeling, retrieving, sharing, and evaluating an enterprise's data and knowledge assets. Focuses on the understanding of data and knowledge management, data warehousing, data mining (including rule-based systems, decision trees, neural networks, etc.), and other business intelligence concepts. Covers the organizational, technological and management perspectives.

MBAD 6202. Digitization of Business Processes. (0 to 3)

Examination of key issues involved in digitization of business processes. Topics include: digitization strategies, systems analysis and design, data management, evaluation of IT investments, and management of emerging technologies.

MBAD 6204. Management of Cybersecurity and Privacy. (0 to 3)

Prerequisite(s): MBAD 5121 or equivalent. Managing key cybersecurity and privacy challenges faced by IT managers. Examines computer network concepts, threat environments, cybersecurity tools, methods, and controls for risk management and the development of cybersecurity management and policy. Various

cybersecurity and privacy standards and evaluation criteria are also covered.

MBAD 6207. Business Project Management. (0 to 3)

Cross-listed Course(s): DSBA 6207. Project management is widely used in a variety of business environments to manage complex, non-routine endeavors. Examples of projects include consulting and process improvement projects, advertising projects, and technology projects. This course focuses on tools, techniques, and skills for business project management, with attention to both the quantitative and the qualitative aspects of project management. Topics include: project evaluation, estimation, monitoring, risk management, audit, managing global projects, outsourcing, and project portfolio management. Students also gain experience using Project Management Software.

MBAD 6208. Supply Chain Management. (0 to 3)

Cross-listed Course(s): DSBA 6208. Supply chain management is concerned with all of the activities performed from the initial raw materials to the ultimate consumption of the finished product. From a broad perspective, the course is designed to examine the major aspects of the supply chain: the product flows; the information flows; and the relationships among supply chain participants. The course content is interdisciplinary in nature and will cover a variety of topics such as supply chain information technologies, supply chain design, strategic alliances between supply chain participants and supply chain initiatives.

MBAD 6209. Management of Service Operations. (3)

Focuses on the challenges of managing service operations. The major topics covered are those critical to achieving operational excellence, including the design and delivery of services, service productivity, revenue management, risk management, customer contact management, service quality and customer retention, capacity management, and demand management. The course uses cases, readings, lectures and problem-solving tools to provide students with an understanding of these topics.

MBAD 6211. Advanced Business Analytics. (0 to 3)

Cross-listed Course(s): DSBA 6211. Prerequisite(s): MBAD 6201, ITCS 6162, or permission of department. An in-depth study of applications of data analytics techniques to discover non-trivial relationships that are understandable, useful, and actionable to decision makers. A case approach is used to emphasize hands-on learning and real-world deployment of business analytics.

MBAD 6212. Enterprise Systems. (3)

Prerequisite(s): Permission of DSBA Program Director. An overview of Enterprise Resource Planning (ERP). Using business cases and hands-on training with ERP tools, students learn how ERP systems support an organization's core business

processes in achieving its strategic and operational goals. The role of ERP systems in business analytics and intelligence, the configuration of ERP systems, and the methods of evaluation, selection and implementation of ERP systems are also covered.

MBAD 6213. Applied Healthcare Business Analytics. (3)

Cross-listed Course(s): DSBA 6213 and HCIP 6213. Prerequisites: Demonstrated proficiency with Microsoft Excel; STAT 5123, HADM 6108 (for students with background in healthcare administration), HCIP 6108 (for students with background in healthcare informatics), or equivalent. Focuses on applying business analytics within the healthcare setting. Students learn analytical tools used to synthesize big data into meaningful management information that is used in making key business decisions that impact the delivery of healthcare services. Case studies are utilized to prepare students for delivering boardroom level presentations of their findings.

MBAD 6238. Real Estate and Urban Economics. (3)

Prerequisite(s): ECON 2102. Cross-listed Course(s): ECON 6238 and MSRE 6238. Focuses on the fundamental economic forces that create urban areas, with a special emphasis on land markets. Integrates economic theory to better understand the market forces that impact applied real estate development projects. Topics include: urban growth and development; land valuation; the modelling and estimation of agglomeration economies; the costs of cities and their internal structure with emphasis on land use regulations and transportation; amenities and the local supply of labor; the sizes and functions of cities; affordable housing; and local public finance.

MBAD 6258. Site Feasibility Analysis. (0 to 3)

Cross-listed Course(s): GEOG 6305 and MSRE 6258. Prerequisite(s): Permission of instructor. Examination of factors affecting the feasibility of land parcels for commercial and residential development with emphasis on the physical evaluation of a given site, the market support for its intended use, and the financial support for the proposed development.

MBAD 6259. Applied Real Estate Development. (0 to 3)

Cross-listed Course(s): MSRE 6259. Prerequisite(s): MBAD 6159 or MSRE 6159. The application of the processes involved in real estate development. Students will work in groups on a semester project to select a site and prepare an appropriate development plan that emphasizes the market and financial feasibility of the real estate development.

MBAD 6270. Marketing Management. (0 to 3)

A managerial approach to strategic marketing decision-making. Topics include: market segmentation, product strategy, pricing strategy, promotion strategy, distribution strategy, demand analysis, future market projection and

global marketing. Case studies, readings, and simulations are used.

MBAD 6271. Consumer Behavior and Strategy. (0 to 3)

Prerequisite(s): MBAD 6270. The consumer is the central focus of all business activity. Designed to help understand consumption-related behaviors and develop marketing strategies to influence those behaviors. Behavioral concepts are applied to develop dynamic and effective marketing strategies from the perspective of the marketing manager.

MBAD 6272. Marketing Analysis and Decision-Making. (0 to 3)

Prerequisite(s): MBAD 6270. Planning, execution, analysis, and evaluation of marketing research activities. Emphasis on the techniques and methodology used in the collection, analysis, and interpretation of economic, demographic, and sociological data for use in marketing decision-making.

MBAD 6273. Product and Brand Strategy in the

Connected World. (0 to 3) Prerequisite(s): MBAD 6270. Organizations are increasingly recognizing that the development of differentiated products and the creation of strong brands are fundamental strategic imperatives, as they are key to a wide range of important business outcomes. This trend is evidently strong in the connected world, where omnichannel businesses encompass brick-and-mortar and digital channels. In this course, the concepts, theories, and frameworks related to the creation and management of successful products and brands are explored. Special attention is paid to how the digital era has influenced product development (e.g., the rise of the sharing economy represented by Airbnb and Uber) and how the digital era has complicated brand management (e.g., the influence of online consumer reviews on brand equity). Also explored are the strategies that facilitate firms' success in the modern hyperconnected marketplace.

MBAD 6274. Advertising and Promotion Strategy. (0 to 3)

Prerequisite(s): MBAD 6270. Opportunities and challenges for an organization through advertising, personal selling, sales promotion and publicity. Includes analysis of the legal and ethical problems involved in this area. Case studies and a project assignment are used.

MBAD 6275. Global Marketing Strategy. (0 to 3)

Prerequisite(s): MBAD 6270. Study of opportunities, problems, and techniques involved in marketing globally. Analysis of environmental forces affecting global marketing and the methods used to market effectively on a global scale.

MBAD 6276. Strategic Business Analytics. (0 to 3) Cross-listed Course(s): DSBA 6276. Prerequisite(s): MBAD 6270 or permission of department. The utilization of analytics techniques in marketing decision-making and consumer

strategy. Involves the extraction of hidden insight about consumers from structured and unstructured Big Data, and the translation of that insight into a market advantage. Applications in areas such as consumer targeting, product innovation, and promotion strategy.

MBAD 6277. Social Media Marketing and Analytics. (0 to 3) Cross-listed Course(s): DSBA 6277. Prerequisite(s): MBAD 6270 or permission of department. The utilization of social media in marketing strategy and tactics. Topics include: the use of social media in building brand strength and equity, as a customer acquisition tool, and as a customer relationship management tool. The utilization of analytics in effective social media marketing.

MBAD 6279. Design Thinking and Innovation. (0 to 3) Prerequisite(s): MBAD 6270. The theoretical and practical components of innovation. Introduction to design thinking and the innovation process from idea generation to early design to declaration of importance to delivery to the end user. Implementation of innovations.

MBAD 6282. Marketing of Sports. (0 to 3) Prerequisite(s): MBAD 6270. Marketing concepts and practices applied to the marketing of sports products and services to the sports consumer. Emphasis on strategic marketing planning. Strategies to segment markets and identify customers; generate revenue, fan loyalty, and build the brand; collect and use marketing research data; promotional strategies including endorsements and sponsorships; pricing strategies (ticket prices) for sports teams/individuals in competition.

MBAD 6284. Digital Marketing Analytics. (0 to 3) Explores important techniques in marketing analytics with a focus on digital marketing applications. The primary purpose is to equip students with the essential data-analytical knowledge, methodologies and hands-on experiences in order for the students to have the ability and capability to address major marketing or business questions to make informative decisions. The course is structured on analyzing data through case studies, combined with lectures, discussion, and interactive hands-on exercises.

MBAD 6302. Evaluating Entrepreneurial Opportunities. (0 to 3) Examines how to assess the environmental conditions that surface opportunities for entrepreneurs, including competitor and industry, product, technological, sociocultural, political/legal, economic, and global trends. Students are also tasked with formulating innovative solutions to their discovered opportunities and assessing the attractiveness of their solutions via feasibility analysis.

MBAD 6304. Entrepreneurial Organizing. (0 to 3) Examines how entrepreneurs organize to exploit the opportunities they have recognized. Topics include: organizing rules; establishing routines; bootstrapping resources; market

creation and market testing; and attracting, hiring, and selecting employees.

MBAD 6305. Entrepreneurship and Uncertainty. (0 to 3) Students perform a number of different tasks undefined until assigned during the semester. Potential tasks might include creating a website, putting together a point-of-sale advertisement, selling a thousand candy bars, or organizing an event such as a business plan competition. Students are rated equally and provided feedback on their behaviors and outcomes. Faculty provide limited guidance.

MBAD 6306. Corporate Entrepreneurship. (3) Examines the role of entrepreneurship within existing corporations. Topics not only consider how corporations can more effectively incentivize entrepreneurial activities within their boundaries, but also how individuals can more effectively mobilize support and act entrepreneurially within corporations. In addition, examines how and why new ventures are organized within established corporations.

MBAD 6309. Business Models and Business Plans. (0 to 3) Examines the formulation of business models and plans to detail how to appropriate value from recognized opportunities and innovative solutions. The business model captures a static view of the decisions needed to be made to create value, whereas the business plan provides a dynamic view of the decisions and investments needed to support a business's specific growth objectives.

MBAD 6500. Cooperative Education Experience. (0) Prerequisite(s): Completion of 9 credit hours of graduate coursework; and enrollment in Master's level program (Ph.D. level students are encouraged to contact their academic department to inquire about academic or industrial internship options for credit). Participation enables MBA students to pursue practical work experience that is complementary to their major course of studies. Each student's program must be approved by the director of the MBA program. Participating students pay a course registration fee for transcript notation and receive full-time student status. Assignments must be arranged and approved in advance. For more information, contact the University Career Center. *May be repeated. Graded on a Pass/Unsatisfactory basis.*

MBAD 6777. UNCC EGADE. (0 to 3) EGADE students can use this course to maintain residency at UNC Charlotte while they take courses solely at EGADE. *May be repeated for credit with MBAPD approval.*

MBAD 6890. Directed Individual Study. (3) Prerequisite(s): Permission of a member of the graduate faculty who would direct the study and permission of the MBA Program Director. Directed individual study and in-depth analysis of a special area of management, economics, business or accounting. The course may be used to satisfy

up to six credit hours of graduate credit requirements in the Master of Business Administration degree program. *May be repeated for credit with different area of study.*

MBAD 6962. Energy Markets. (0 to 3) Cross-listed Course(s): EMGT 5962. Prerequisite(s): Basic math and economics, or permission of instructor. Pre- or Corequisite(s): ECON 5181, EMGT 5961, or SEGR 4961. Energy and power systems in regulated and competitive environments and implications on business decisions for firms in these industries. Topics include: mechanism of energy markets; comparative market systems; determination of prices under different market structures; gas, oil, coal, and electricity market architecture; electricity market design; dispatch and new build decisions; smart grid and renewable energy in electricity markets; risk and risk management in energy including demand and price volatility and use of financial derivatives; and the impact of financial market trends and current and proposed policies on the energy industry.

MBAD 7090. Special Topics in Business. (0 to 4) Special topics in any of the functional areas of business. Topics will vary. *May be repeated for credit with change in topic.*

Middle Grades Education (MDLG)

MDLG 5130. The Middle Grades Experience. (2) Current curricular and instructional programs and their impact on the learning of contemporary early adolescents. Reform efforts currently underway in American schools that attempt to address issues surrounding these and other current practices. Developmental characteristics of the early adolescent learner. Clinical experience is required.

MDLG 6225. Issues in Middle Grades Education. (3) Cross-listed Course(s): EDCI 8225. Examination of educational practices in the middle grades (6 to 9), including trends and issues unique to that philosophy. Emphasis on broadening understanding of foundational components, organizational patterns, instructional programs, and management techniques.

MDLG 6470. Middle Grades Education Student Teaching Internship. (3 to 5) Prerequisite(s): ENGL 5254, MAED 5252, MDSK 4253, MDSK 5204, MDSK 5251, MDSK 5255, MDSK 5300, MDSK 6162, MDSK 6252. Completion of all degree and professional education requirements. Prior Admission to the Graduate Certificate in Teaching Program or the Master of Arts in Teaching Program. Completion of all other coursework in a student's program of study GPA of 3.0 and no more than two grades of C in all professional education courses GPA of 2.50 and grades of C or higher in the area of teaching specialization

Overall GPA of 2.50 or higher. Faculty advisor's recommendation certifying readiness to student teach. Additional requirements as determined by specific teacher education programs. Documentation of completion of field experiences in one diverse setting. Cross-listed Course(s): MDSK 6470, SECD 6470. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting and includes a range of seminars. Participating students pay a course registration fee for edTPA portfolio assessment.

MDLG 6800. Individual Study in Middle Grades Education. (1 to 6) Prerequisite(s): Permission of advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

Middle, Secondary, and K-12 Education (MDSK)

MDSK 5000. Topics in Middle and Secondary Education. (1 to 6) May include classroom and/or clinical experiences in the content area. With department approval, *May be repeated for credit with change of topic.*

MDSK 5101. Assessment of Middle Grades and Secondary School Learners in Science. (2) Cross-listed Course(s): MDSK 4101. Prerequisite(s): MDSK 5204 and MDSK 6162. Pre- or Corequisite(s): FLED 5105 and MDSK 5251. For current and future teachers of middle grades and secondary schools to develop multiple criteria assessment models and to master other competencies prescribed by the State of North Carolina, this course provides a foundation in the understanding of authentic assessment and its application in middle and secondary school science classrooms.

MDSK 5102. Assessment of Secondary School Learners in Mathematics. (2) Cross-listed Course(s): MDSK 4102. Prerequisite(s): MDSK 5204 and MDSK 6162. Pre- or Corequisite(s): FLED 5105 and MAED 5252. Fosters secondary mathematics education teacher candidates' knowledge of and skills for creating and implementing equitable assessments in K-12 classrooms. Learning modules provide an overview of the major principles involved in mathematics assessment, focusing on both theoretical and practical issues. Students practice creating/adapting, administering, and/or scoring both formative and summative assessments. Students take into account issues of equity and cultural relevance in this

work. They also practice analyzing data from such assessments, making instructional decisions based on those data, and providing student feedback.

MDSK 5103. Assessment in Teaching Middle and Secondary Social Studies. (2) Cross-listed Course(s): MDSK 4103. Prerequisite(s): MDSK 5204 and MDSK 6162. Pre- or Corequisite(s): FLED 5105 and MDSK 5253. Prepares middle and secondary social studies teachers to plan and implement formal and informal assessments. Encompasses both authentic assessment and more traditional evaluation forms.

MDSK 5104. Assessment in Teaching K-12 English. (2) Cross-listed Course(s): MDSK 4104. Prerequisite(s): MDSK 5204, MDSK 6162, and permission of department. Pre- or Corequisite(s): ENGL 5254 and FLED 5105. Supports current and future English Language Arts teachers as they critically analyze and develop appropriate and diverse assessments for learners. Approaches assessment as a method to support students' literacy development, with particular attention to the ways that assessment should align with and extend students' cultural and learning differences. Examines the alignment across standards and assessment methods and supports students in understanding the ways that assessment data can be analyzed and used to inform future teaching and lesson planning. Finally, students consider how they can engage learners in the assessment process to encourage learners to take responsibility for and ownership over their own learning.

MDSK 5105. Assessment in Teaching Career and Technical Education. (2) Prerequisite(s): MDSK 5204 and MDSK 6162. Pre- or Corequisite(s): FLED 5105 and MDSK 5255. Fosters Career and Technical Education (CTE) teacher candidates' knowledge and skills of creating and implementing content and performance-based assessments in 6-12 classrooms. Learning modules provide an overview of the major principles involved in CTE assessment, focusing on both the theoretical and practical issues. Students practice creating, administering, and scoring assessments. They also practice analyzing data from such assessments, interpreting necessary changes in instruction based on those data, and providing student feedback.

MDSK 5204. The Connected Classroom. (2) Teacher education candidates analyze the complex ecology of the modern classroom in order to create a learning environment that establishes and connects student success and well-being. The course shares research-based strategies to address the academic and emotional needs of students from a variety of backgrounds. Additionally, the course introduces issues, policies, and strategies for modifying standard instruction for students with disabilities and those identified as gifted.

MDSK 5251. Teaching Science to Middle and Secondary School Learners. (3) Cross-listed Course(s): MDSK 4251. Prerequisite(s): MDSK 5204 and MDSK 6162. Corequisite(s): FLED 5105. Comprehensive overview of both science education and the nature of science. Planning and implementing effective learning experiences and assessment for both the number and the diversity of learners in a middle or secondary science classroom. Extensive clinical experience is required.

MDSK 5253. Teaching Social Studies to Middle and Secondary School Learners. (3) Cross-listed Course(s): MDSK 4253. Prerequisite(s): MDSK 5204 and MDSK 6162. Corequisite(s): FLED 5105. Comprehensive overview of history and social studies education with an emphasis on providing opportunities for history and social studies teachers to create relevant, stimulating, content specific lessons for the diversity of students in middle or secondary schools. Extensive clinical experience is required.

MDSK 5255. Methods in Teaching Career and Technical Education. (3) Prerequisite(s): MDSK 5204 and MDSK 6162. Corequisite(s): FLED 5105. Fosters Career and Technical Education (CTE) teacher candidates' knowledge and skills of creating and implementing lessons in 6-12 CTE classrooms. Learning modules provide an overview of the major principles involved in business and marketing instruction, focusing on both the theoretical and practical issues. Students practice creating and implementing instruction. They also practice analyzing and reflecting upon their instruction for the purpose of making adjustments to improve practice. The course is to be taken in conjunction with a corequisite lab where candidates have the opportunity to rehearse strategies taught and receive peer and instructor feedback.

MDSK 5300. Content Area Instruction and Assessment. (3) Cross-listed Course(s): MDSK 4300. Prerequisite(s): MDSK 5204 and MDSK 6162. Prepares candidates to plan and implement formal and informal assessments. Learning modules provide candidates opportunities to learn the major principles of various types of assessments; evaluate assessments for curriculum alignment and learning; evaluate assessments for bias; and develop and implement assessment in order to interpret K-12 content knowledge and provide student feedback and make future instructional decisions. The course also provides candidates exposure to the continued modeling of evidence-validated practices, the rehearsal of instructional tasks, and numerous opportunities for feedback on pedagogical decision-making within the content area.

MDSK 6150. Models of Teaching. (3) Learning theory associated with information processing, personal, social, and behavioral models; current trends in instructional methodology for a variety of content areas.

MDSK 6156. Curriculum, Teaching, and Contemporary Issues in Education. (3) A consolidated examination of curriculum and learning theory with emphasis on educational reform and the origins of contemporary issues in education. Merges curriculum and learning theory to examine contemporary issues in education.

MDSK 6162. Planning for K-12 Instruction. (3) Introduction to the systematic process of planning for effective instruction, assessment, technology integration, and classroom leadership. Clinical experience is required.

MDSK 6220. Adolescence and Learning. (2 or 3) Study of adolescence as a phase of development and its relationship to the learning process.

MDSK 6250. Issues in 6-12 Science Education. (3) Orientation to content, curriculum and methods appropriate for teaching science. Emphasis is on a critical examination of current trends and practices in the teaching of science.

MDSK 6252. Differentiated Instruction for Adolescent Learners. (1 to 3) This course prepares candidates to analyze and evaluate differentiated instructional strategies in a K-12 classroom. Candidates will apply their understanding of differentiated instruction by developing lesson plans specific to differentiated instruction based on content, learner readiness, learner products and outcomes, and environment.

MDSK 6254. Issues in 6-12 Social Studies Education. (3) Current issues in teaching and learning social studies. Emphasis on current trends in curriculum, advanced instructional methods, and research.

MDSK 6260. Teacher Leadership. (3) An examination of the current research on adult learning and development, expert knowledge, and the professionalization of the field of teaching. Students develop skills to direct other educational professionals.

MDSK 6262. AI and EdTech in the Classroom. (3) Explores the role of education technology (EdTech), with a focus on AI/GenAI, in middle, secondary and K-12 education. Students will develop the knowledge and skills to effectively integrate these tools into their teaching and education leadership by developing engaging lessons, implementing technology-enhanced assessments, and promoting digital literacy and responsible digital citizenship. This course also addresses the ethical considerations surrounding the integration of EdTech in middle and secondary education, including questions of access, academic integrity, student privacy, and data security.

MDSK 6264. Primary and Secondary Source Analysis. (3) Advanced content course for middle and secondary social

studies teachers seeking advanced social studies licensure. Provides a focused study of primary and secondary sources that effectively support middle and secondary student understanding of social studies content. Emphases include increased content knowledge of social studies, extensive content research and reading, development of content resources, application of advanced instructional methods through the integration of content resources to support student learning of social studies content, and experience in curriculum evaluation.

MDSK 6351. Advanced Methods in Middle and Secondary Science. (3) Examination of current research and scholarship on the teaching of science in middle and secondary schools. Particular emphasis on the development of advanced instructional expertise and leadership.

MDSK 6354. Advanced Methods in Middle and Secondary Social Studies. (3) Examination of current research and scholarship on the teaching of social studies in middle and secondary schools. Particular emphasis on the development of advanced instructional expertise and leadership.

MDSK 6355. Advanced Methods of Teaching Career and Technical Education (CTE). (3) A variety of topics are addressed in order to prepare experienced Career and Technical Education teachers to become leaders in the field by developing as critical thinkers, researchers in the curriculum area, as well as instructional and program leaders. Topics include: theories of CTE acquisition, the history and trends of CTE instructional methods, curriculum design, research-based practices, community partnerships, and mentoring of beginning teachers.

MDSK 6470. Graduate Student Teaching and Internship. (3 to 6) Prerequisite(s): completion of all coursework required for the "A" license completion of an application for the course by the established deadline, and approval of the department. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting. Includes seminars. Participating students pay a course registration fee for edTPA portfolio assessment. *Graded on a Pass/Unsatisfactory basis.*

MDSK 6691. Seminar in Professional Development. (3) Seminar focused on the self-direction and professional development of teachers. Emphasis placed on the design, development, and completion of the candidate's comprehensive portfolio, thesis, or research project.

Mechanical Engineering (MEGR)

MEGR 5090. Special Topics in Mechanical Engineering. (3)

Cross-listed Course(s): MEGR 4090. Prerequisite(s): Mechanical Engineering major. Builds upon and synthesizes the knowledge that students have gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course serves as the means for teaching engineering analysis, synthesis, and/or design. *May be repeated for credit with change of topic.*

MEGR 5091. Special Topics in Aerospace Engineering. (3)

Cross-listed Course(s): MEGR 4091. Prerequisite(s): MEGR major. Builds upon and synthesizes the knowledge that the students have gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course will broaden and deepen students' knowledge in areas of aerospace engineering, including but not limited to: aerospace propulsion, aerospace materials, aerospace structures, aerospace vehicle design, astromechanics, flight dynamics, and aerospace vehicle guidance, navigation, and control. *May be repeated for credit with change of topic.*

MEGR 5092. Special Topics in Motorsports Engineering. (3)

Cross-listed Course(s): MEGR 4092. Prerequisite(s): Mechanical Engineering major. Builds upon and synthesizes the knowledge gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course serve as the means for teaching engineering analysis, synthesis, and/or design in topics that relate to Motorsports Engineering. *May be repeated for credit with change of topic.*

MEGR 5094. Special Topics in Energy Engineering. (3)

Cross-listed Course(s): MEGR 4094. Prerequisite(s): Mechanical Engineering major. Builds upon and synthesizes the knowledge gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course serve as the means for teaching engineering analysis, synthesis, and/or design in topics that relate to Energy Engineering. *May be repeated for credit with change of topic.*

MEGR 5097. Special Topics in Biomedical Engineering. (3)

Cross-listed Course(s): MEGR 4097. Prerequisite(s): Mechanical Engineering major. Builds upon and synthesizes the knowledge that students have gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course serves as the means for teaching engineering analysis, synthesis, and/or design in topics that relate to Biomedical

Engineering. *May be repeated for credit with change of topic.*

MEGR 5098. Special Topics in Precision Engineering. (3)

Cross-listed Course(s): MEGR 4098. Prerequisite(s): Mechanical Engineering major. Builds upon and synthesizes the knowledge that the students have gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course serve as the means for teaching engineering analysis, synthesis, and/or design. *May be repeated for credit with change of topic.*

MEGR 5143. Mechanical Vibrating Systems. (3)

Cross-listed Course(s): MEGR 4143. Prerequisite(s): Mechanical Engineering major. Analysis of vibrations and dynamics. Topics include: classical mechanics, single degree of freedom systems, multi-degree of freedom systems, continuous systems, single degree of freedom nonlinear systems, random vibrations, and spectral analysis.

MEGR 5210. Automotive Powerplants. (3)

Cross-listed Course(s): MEGR 4210. Prerequisite(s): Mechanical Engineering major. The engineering principles governing internal combustion engine theory, design, and applications.

MEGR 5211. Road Vehicle Dynamics. (3)

Cross-listed Course(s): MEGR 4211. Prerequisite(s): Mechanical Engineering major. Topics related to vehicle dynamics and modeling thereof. Acceleration and braking performance, road loads, steady-state cornering, suspension, steering system, and tire behavior.

MEGR 5235. Waves and Optics. (3)

Cross-listed Course(s): MEGR 4235. Prerequisite(s): Mechanical Engineering major. An introductory study of optics covering geometrical optics, optical instruments, wave optics (interference and diffraction), Fourier analysis, and polarization.

MEGR 5237. Introduction to Control Systems. (3)

Cross-listed Course(s): MEGR 4237. Prerequisite(s): Mechanical Engineering major. Fundamentals of classical control analysis and design. Topics include: modeling and analyzing control systems; design of automatic controllers.

MEGR 5240. Advanced Automotive Powerplants. (3)

Cross-listed Course(s): MEGR 4240. Prerequisite(s): MEGR 5210 and Mechanical Engineering major. Advanced engineering principles governing internal combustion engine theory, design, and application.

MEGR 5242. Applied Vehicle Aerodynamics. (3)

Cross-listed Course(s): MEGR 4242. Prerequisite(s): Mechanical Engineering major. Flow of air around streamlined and bluff bodies, aerodynamic forces, understanding flow separation and reattachments, aerodynamic tools,

introduction to computational fluid dynamics, use of commercial CFD packages to solve fluid flow problems, computer simulation and analysis of flow around bluff bodies and road vehicles, including race cars.

MEGR 5244. Tire Mechanics. (3) Cross-listed Course(s): MEGR 4244. Prerequisite(s): Mechanical Engineering major. In-depth analysis of the tire and its influence on vehicle performance, including: design, materials, construction, structural response, rolling resistance, force and moment generation, NVH, wet and dry traction, wear, high speed limit, and standards. Tire models, their limitations, and their governing equations.

MEGR 5271. Orthopedic Biomechanics. (3) Cross-listed Course(s): MEGR 4271. Prerequisite(s): Mechanical Engineering major. Introduces mechanical properties of the human body's hard tissues (bone and cartilage) and soft tissues (muscles, ligament, and tendon), and joint biomechanics. Focuses on mechanical and biological considerations for treatment of orthopedic diseases and sports injuries, such as bone fractures, ACL injury, and osteoarthritis. Students learn to solve medical problems using their engineering knowledge and skills.

MEGR 5272. Mechanics of the Human Locomotor System. (3) Cross-listed Course(s): MEGR 4272. Prerequisite(s): Mechanical Engineering major. Introduces dynamic analysis of the human musculoskeletal system. Students learn to develop 3-D rigid body models of human movement, and how to calculate internal forces in muscles and joints during daily and sports activities. Students also learn how to use motion capture system and simulation software of human locomotion.

MEGR 5273. Regenerative Neural Engineering. (3) Cross-listed Course(s): MEGR 4273. Prerequisite(s): Mechanical Engineering major. The basic principles of neuroscience and biomedical engineering, and the use of these principles in regenerative neural engineering. Topics include: the state of the art in the use of advanced 3D bioprinting, stem cells, conductive materials, nanomaterials, neural modeling, and brain machine interfaces as applied to solving prevalent clinical issues related to neurology.

MEGR 5274. Bioelectronic Medicine. (3) Cross-listed Course(s): MEGR 4274. Prerequisite(s): Mechanical Engineering major. The basic principles of neuroscience and neural engineering, and the use of engineering principles in bioelectronic medicine. Topics include: the use of optogenetics, electrical stimulation, electromagnetic stimulation, and brain machine Interfaces as applied to solving prevalent clinical issues related to neurology and neural engineering.

MEGR 5280. Advanced Manufacturing Processes. (3) Cross-listed Course(s): MEGR 4280. Prerequisite(s):

Mechanical Engineering major. Detailed analytical treatment of manufacturing materials, processes, and procedures. Forming processes, casting processes, metal cutting processes, tool materials, joining processes, automation, and economics.

MEGR 5290. Introduction to Electric Vehicles and Batteries. (3) Cross-listed Course(s): MEGR 4290. Introduction to the drivetrain and power supply of electric vehicles. Automotive drive cycle analysis and range estimation for conventional vehicles, hybrid vehicles and electric vehicles. Fuel efficiency, carbon emissions, and power requirements of all three types of vehicles will be discussed. Discussions on different types of batteries and their challenges. Basics of battery chemistry and sizing for vehicle demands.

MEGR 5291. Battery Performance and Testing. (3) Cross-listed Course(s): MEGR 4291. Introduces the basic characterization and fundamental working mechanisms of the equipment. Also, students will have the chance to operate the equipment including cyclers, electrochemistry workstation, glovebox battery assembling, etc.

MEGR 5292. Materials Science in Battery Technology. (3) Cross-listed Course(s): MEGR 5292. Introduction to the materials science used in advanced battery technology, especially Li-ion battery technology. Discussions will include basic electrochemical engineering, battery component materials (i.e. electrodes, electrolytes, separator), underlying properties and performance, and full devices.

MEGR 5310. Uncrewed Aerial Vehicles. (3) Prerequisite(s): MEGR major. Fundamental concepts and technologies related to the dynamics, control, navigation, and guidance of uncrewed aerial vehicles (UAVs).

MEGR 5311. Aerospace Materials. (3) Prerequisite(s): MEGR major. Cross-listed Course(s): MEGR 4311. Overview and analysis of weight-efficient and high-performance advanced materials for aerospace and other mechanical engineering applications, including composites, polymers, and ceramics.

MEGR 5312. Aerospace Propulsion. (3) Prerequisite(s): MEGR major. Cross-listed Course(s): MEGR 4312. An overview of aerospace propulsion and turbomachinery systems, including fundamentals of aerothermodynamics, compressible fluid flows, combustion, propeller propulsion, air-breathing engines, and rocket propulsion.

MEGR 6000. Research Seminar. (1) Presentations on the current research in Mechanical Engineering, Engineering Science, and related fields. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

MEGR 6090. Special Topics in Mechanical Engineering. (3)
Prerequisite(s): Mechanical Engineering major. Directed study of current topics of special interest. *May be repeated for credit.*

MEGR 6141. Theory of Elasticity I. (3) Cross-listed Course(s): MEGR 8141. Introduction to the theory of elastic media; the fundamentals of stress, strain, stress-strain relationships, compatibility and equilibrium. Applications to two- and three-dimensional problems. Structural mechanics and energy methods. Credit will not be awarded for MEGR 6141 where credit has been awarded for MEGR 8141.

MEGR 6166. Mechanical Behavior of Materials I. (3) Cross-listed Course(s): MEGR 8166. Macroscopic and microscopic aspects of elastic and plastic deformation and fracture of engineering materials; applications of dislocation theory to an interpretation and control of mechanical properties; temperature, strain rate and texture effects. Credit will not be awarded for MEGR 6166 where credit has been awarded for MEGR 8166.

MEGR 6181. Engineering Metrology. (3) Cross-listed Course(s): MEGR 8181, OPTI 6381, and OPTI 8381. Introduction to metrology and standards. Uncertainty, precision and accuracy in metrology. Measurement of size and form, computational methods in measurement of form. Measurement of surface texture and out of roundness. Machine tool and robot accuracy and calibration. Evaluation of screw threads and gears. Introduction to design of precision instruments. Credit will not be awarded for MEGR 6181 where credit has been awarded for MEGR 8181.

MEGR 6990. Industrial Internship. (1 to 3) Cross-listed Course(s): MEGR 8990. Prerequisite(s): Completion of nine hours of graduate coursework. Full- or part-time academic year internship in engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by their graduate program director. Requires a mid-term report and final report to be graded by the supervising faculty.

MEGR 7090. Special Topics in Mechanical Engineering. (3)
Directed study of current topics of special interest for Master's degree. *May be repeated for credit.*

MEGR 7099. Special Topics in Battery Engineering. (3)
Cross-listed Course(s): MEGR 8099. Builds upon and synthesizes the knowledge that the students have gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course will broaden and deepen students' knowledge in areas including battery failure analysis, battery recycling, new advances of raw materials (cathode, anode,

electrolyte, separator), battery manufacturing and design, and applications to electrical vehicles, cellphone, energy storage system, etc. *May be repeated for credit with change of topic.*

MEGR 7104. Fabrication of Nanomaterials. (3) Cross-listed Course(s): MEGR 8104. Prerequisite(s): NANO 8101 or permission of instructor. Lithographic methods (CVD, PVD, e-beam, ion beam, magnetron, evaporation, spin coating, mask fabrication, developing resists); microelectromechanical systems and nanoelectromechanical systems; limits of conventional mechanical processing, electroforming, growth mechanisms (organic, inorganic, thermal); powders. Credit will not be awarded for MEGR 7104 where credit has been awarded for MEGR 8104.

MEGR 7104. Fabrication of Nanomaterials. (3) Cross-listed Course(s): ECGR 7104 and MEGR 8104. Prerequisite(s): NANO 8101 or permission of instructor. Lithographic methods (CVD, PVD, e-beam, ion beam, magnetron, evaporation, spin coating, mask fabrication, developing resists); microelectromechanical systems and nanoelectromechanical systems; limits of conventional mechanical processing, electroforming, growth mechanisms (organic, inorganic, thermal); powders. Credit will not be awarded for MEGR 7104 where credit has been awarded for ECGR 7104 or MEGR 8104.

MEGR 7108. Finite Element Analysis and Applications. (3)
Cross-listed Course(s): MEGR 8108. An introduction to the finite element method and its application to engineering problems. Application of the displacement methods to plane stress, plane strain, plate bending and axisymmetrical bodies. Topics may include, but are not limited to: dynamics, heat conduction, and structural mechanics. Credit will not be awarded for MEGR 7108 where credit has been awarded for MEGR 8108.

MEGR 7110. Advanced Conductive Heat Transfer. (3)
Cross-listed Course(s): MEGR 8110. Prerequisite(s): MEGR 3116 or equivalent. Theory of steady and unsteady heat conduction in isotropic and anisotropic media. Treatment of concentrated and distributed heat sources. Application of the finite difference and finite element methods. Credit will not be awarded for MEGR 7110 where credit has been awarded for MEGR 8110.

MEGR 7113. Dynamics and Thermodynamics of Compressible Flow. (3) Cross-listed Course(s): MEGR 8113. Compressible flow equations, isentropic flow, normal shock waves, Fanno and Rayleigh line flows. Nonsteady one dimensional flow. Credit will not be awarded for MEGR 7113 where credit has been awarded for MEGR 8113.

MEGR 7114. Advanced Fluid Mechanics. (3) Cross-listed Course(s): MEGR 8114. Unified tensorial-theoretical treatment of the transport of mass, momentum, energy and vorticity in fluids. General theorems for inviscid and irrational flows. Viscous effects, boundary layer theory, nonlinear phenomena hydrodynamic instability and turbulence with applications. Credit will not be awarded for MEGR 7114 where credit has been awarded for MEGR 8114.

MEGR 7115. Convective Heat Transfer. (3) Cross-listed Course(s): MEGR 8115. Prerequisite(s): MEGR 3116 and MEGR 4112, or equivalents. Heat and momentum transfer prediction in channel flows and boundary layers. Differential equation methods for fully developed and entry length laminar tube flows. Similarity solution for laminar heat transfer. Superposition methods for non-uniform boundary conditions. Integral equations of the boundary layer, approximate and semiempirical methods of solution. Credit will not be awarded for MEGR 7115 where credit has been awarded for MEGR 8115.

MEGR 7117. Statistical Thermodynamics. (3) Cross-listed Course(s): MEGR 8117. Quantum mechanics-based statistical mechanics. Equilibrium macroscopic and microscopic thermodynamic states. Ensemble theory, including classical phase spaces, Liouville theorem, quantum modifications, and Gibbs microcanonical, canonical, and grand canonical ensembles. Introduction to quantum mechanics, including Hamiltonian systems, the density matrix, and quantum statistics. Theory of ideal quantum gases and non-interacting Boson and Fermi-Dirac systems.

MEGR 7119. Thermal Applications in Biomedical Engineering. (3) Cross-listed Course(s): MEGR 8119. Prerequisite(s): permission of department. Application of thermodynamic and heat transfer principles to the analysis of biomedical systems. Topics include: thermodynamic and transport properties of biological tissue, thermoregulation, design and use of cryosurgical probes, and numerical modeling methods. Credit will not be awarded for MEGR 7119 where credit has been awarded for MEGR 8119.

MEGR 7129. Structural Dynamics of Production Machinery. (3) Cross-listed Course(s): MEGR 8129. Prerequisite(s): permission of department. The analytical study of dynamic characteristics of production machinery and the corresponding measurement, specification, and effects on machine performance. Machine tool vibration, machine tool stability, high speed machining. Credit will not be awarded for MEGR 7129 where credit has been awarded for MEGR 8129.

MEGR 7130. Introduction to Control Systems (3) Cross-listed Course(s): MEGR 8130. Introduction to key principles behind feedback control, including closed-loop time

domain and frequency domain analysis, root locus design, state feedback, robustness margins, and loop shaping.

MEGR 7131. Automotive Power Plants. (3) Cross-listed Course(s): MEGR 8131. Energy analysis of internal and external combustion engines for vehicular propulsion. Thermodynamic principles for combustion efficient use of fuel combustion, different types of fuel use, and pollutant control.

MEGR 7132. Advanced Automotive Power Plants. (3) Cross-listed Course(s): MEGR 8132. Prerequisite(s): MEGR 7131 or MEGR 8131. Follow-up course to Automotive Power Plants. Topics include: combustion, thermodynamic efficiency, fuel efficiency, torque and power, emissions, etc.

MEGR 7133. Applied Vehicle Aerodynamics. (3) Cross-listed Course(s): MEGR 8133. Prerequisite(s): Foundational knowledge of fluid mechanics and numerical methods in engineering applications. Examination of the flow of air around streamlined and bluff bodies, aerodynamic forces, understanding flow separation and reattachments, aerodynamic tools, introduction to computational fluid dynamics, use of commercial CFD packages to solve fluid flow problems, computer simulation, and analysis of flow around bluff bodies and road vehicles, including racecars.

MEGR 7134. Advanced Road Vehicle Dynamics. (3) Cross-listed Course(s): MEGR 8134. Prerequisite(s): MEGR 3121, MEGR 3122, and MATH 2171. Advanced topics related to vehicle dynamics and modeling. Acceleration and braking performance, road loads, steady-state cornering, suspension, steering system, and tire behavior are explored.

MEGR 7135. Advanced Tire Mechanics. (3) Cross-listed Course(s): MEGR 8135. Prerequisite(s): MEGR 2144 and MEGR 3121 with grades of C or above. In-depth analysis of the tire and its influence on vehicle performance, including: design, materials, construction, structural response, rolling resistance, force and moment generation, NVH, wet and dry traction, wear, high speed limit, and standards. Tire models, their limitations, and their governing equations. Graduate students develop an experiment (in addition to a literature review), gather data, submit an abstract to the Fall Tire Society Conference, and write a rough draft of a paper.

MEGR 7136. Automotive Materials. (3) Cross-listed Course(s): MEGR 8136. A broad range of automotive materials from steel, aluminum to new materials, such as composite materials. During the class, students are tutored to understand how the industry selects, designs, manufactures, and applies materials for automobiles in general, and what are current applications of various available materials in the automotive industry. Emphasis on

structural materials where crashworthiness and structural integrity are important. Basic understanding of mechanics of materials; e.g., Introduction of Solid Mechanics, Introduction of Material Engineering, Mechanics of Materials.

MEGR 7142. Theory of Elasticity II. (3) Cross-listed Course(s): MEGR 8142. Prerequisite(s): MEGR 6141. Continuation of MEGR 6141 with additional topics in three-dimensional analyses. Topics include coupled material behavior, variational methods, and numerical techniques. Credit will not be awarded for MEGR 7142 where credit has been awarded for MEGR 8142.

MEGR 7143. Inelastic Behavior of Materials. (3) Cross-listed Course(s): MEGR 8143. Prerequisite(s): MEGR 6141 or permission of department. Introduction to plasticity and linear viscoelasticity. Topics include: a study of yield criteria, plastic stress-strain relations, plastic hinge analysis, discrete viscoelastic models, the hereditary integral and selected boundary value problems. Credit will not be awarded for MEGR 7143 where credit has been awarded for MEGR 8143.

MEGR 7145. Advanced Topics in Dynamics. (3) Cross-listed Course(s): MEGR 8145. Selected advanced topics in dynamics such as Lagrangian dynamics, vibrations of continuous media, stress wave propagation, and motion measurement. Credit will not be awarded for MEGR 7145 where credit has been awarded for MEGR 8145.

MEGR 7151. Orthopedic Biomechanics. (3) Cross-listed Course(s): MEGR 8151. Prerequisite(s): Permission of instructor. Introduces mechanical properties of the human body's hard tissues (bone and cartilage) and soft tissues (ligament and tendon). Focus is placed on mechanical and biological considerations for treatment of orthopedic diseases and sports injuries, such as fracture, ACL injury, and osteoarthritis. Students learn how to solve medical problems using their engineering knowledge and skills, such as finite element analysis and inverse dynamics.

MEGR 7152. Mechanics of the Human Locomotor System. (3) Cross-listed Course(s): MEGR 8152. Prerequisite(s): Permission of instructor. Introduces dynamic analysis of the human musculoskeletal system. Students learn to develop 3-D rigid body models of human movement, calculate internal forces in muscles and joints during daily and sports activities, and how to use motion capture system and simulation software of human locomotion.

MEGR 7163. Materials Characterization and Analysis. (3) Cross-listed Course(s): MEGR 8163. Designed for graduate students to gain an in-depth understanding of principal methods in materials characterization and analysis. Students learn different techniques of materials characterization and analysis, including: (1) structure

identification using electron and X-ray diffractions, (2) morphology study using electron microscopy, (3) composition and chemical state determination using electron spectroscopy and other techniques. Focuses on fundamental concepts of different methods, as well as hands-on experience. Well-designed lab sessions are provided for students to practice selected techniques using different instruments (e.g., XRD, SEM, EDS, and sputtering coating).

MEGR 7166. Deformation and Fracture of Materials. (3) Prerequisite(s): permission of department. Macroscopic and microscopic aspects of elastic and plastic deformation and fracture; applications of dislocation theory to an interpretation and control of mechanical properties; temperature, strain rate and texture effects. Credit will not be awarded for MEGR 7166 where credit has been awarded for MEGR 8166.

MEGR 7169. Introduction to Transmission Electron Microscopy. (3) Cross-listed Course(s): MEGR 8169. Designed for graduate students with various academic backgrounds, including engineering, nanoscale science, physics, chemistry, and biology. Introduces the theoretical and practical concepts of transmission electron microscopy (TEM). Topics include: basic instrumentation of TEM, diffraction, imaging, and microanalysis. In addition to classroom lectures, students have opportunities to gain hands-on experience of operating a state-of-the-art TEM system and several sample preparation tools. The course consists of weekly lectures and weekly lab sections. The final grade is determined based on homework, lab reports, and examinations.

MEGR 7170. Fracture Mechanics. (3) Cross-listed Course(s): MEGR 8170. Fracture Mechanics is a specialized field of study that focuses on the behavior of materials under loading conditions that lead to the propagation of cracks. This course aims to provide graduate students with a comprehensive understanding of the fundamental principles, theories, and practical applications of fracture mechanics. The course will cover topics such as stress analysis, crack propagation, energy release rate, fracture toughness, and failure criteria. Through lectures and assignments, students will develop the necessary skills to analyze and predict the behavior of materials in the presence of cracks and apply fracture mechanics principles to solve real-world engineering problems.

MEGR 7171. Phase Transformation in Solids. (3) Cross-listed Course(s): MEGR 8171. Phase transformation commonly occurs during materials manufacturing (e.g., additive manufacturing), processing and in service. This course lays a foundation for understanding phase transformation in terms of thermodynamics and kinetics, as well as transformation mechanisms down to the atomic scale.

Special topics on phase transformation during additive manufacturing will also be included.

MEGR 7172. Computational Methods in Engineering. (3)

Cross-listed Course(s): MEGR 8172. Numerical linear algebra, solution of systems of equations, numerical integration, differentiation and interpolation, root finding, numerical solution of partial differential equations by finite difference and finite element methods. Credit will not be awarded for MEGR 7172 where credit has been awarded for MEGR 8172.

MEGR 7173. Engineering Design Optimization. (3)

Cross-listed Course(s): MEGR 8173. Prerequisite(s): Permission of instructor and programming knowledge in C, C++, FORTRAN, or Matlab. Concepts of optimization and associated terminology. Proper optimization formulation and application in engineering design. Methods for simulation-based optimization with approximation techniques. Credit will not be awarded for MEGR 7173 where credit has been awarded for MEGR 8173.

MEGR 7174. Engineering Analysis I. (3) Cross-listed Course(s): MEGR 8174. An overview of Ordinary Differential Equations, Partial Differential Equations, Fourier series, and Laplace Transforms.

MEGR 7175. Engineering Analysis II. (3) Cross-listed Course(s): MEGR 8175. An overview of Linear Algebra, including Matrix-Matrix operations, types of matrices, Gaussian Elimination, Rank of a Matrix, Eigenvalues and Eigenvectors, Singular Value Decomposition, Approximations of Functions with Fourier Series, Discrete Fourier Transform, Hankel Transform, Orthogonal Polynomials.

MEGR 7182. Machine Tool Metrology. (3) Cross-listed Course(s): MEGR 8182. Machine tool accuracy and performance testing. Modeling and measurement of volumetric accuracy using parametric error separation and quasi-static error models. Use of homogeneous transformations for error mapping. Linear and higher order thermal models. Error budgeting and management. Axis of rotation metrology, spindle accuracy, and cutting performance tests. Laboratory experience on CNC machine tools using heterodyne laser interferometers, capacitance gages, and other computer assisted sensor systems for machine checking. Credit will not be awarded for MEGR 7182 where credit has been awarded for MEGR 8182.

MEGR 7183. Design of Precision Machines and Instruments I. (3)

Cross-listed Course(s): MEGR 8183. Basic patterns in the design of precision machines and instruments. Design process, error assessment and examples, materials, sensors, drives, and controls for precision machines. Machine frames, sliding and rolling element bearings,

flexures, hydrostatic bearings. Design methodology, analysis of potential design, design case studies, and modeling of design alternatives. Credit will not be awarded for MEGR 7183 where credit has been awarded for MEGR 8183.

MEGR 7185. Gear Manufacturing and Metrology. (3)

Cross-listed Course(s): MEGR 8185. Fundamentals of manufacturing techniques (e.g., turning, milling, grinding, honing), including the corresponding tools and machine tools. Fundamental knowledge about design, machine components, and tolerances. Introduces the basic knowledge about metrology and standards, statistics, measurement uncertainty, calibration; measurement of geometric quantities (size, form, surface texture). Mathematics, namely elementary vector analysis, approximation algorithms are studied.

MEGR 7186. Data Analysis and Uncertainty. (3)

Cross-listed Course(s): MEGR 8186. Intended for graduate students from science and engineering disciplines, with a focus on optical engineering and mechanical engineering. Introduces the principles of measurement uncertainty assessment, uncertainty analysis methodologies, and data analysis/reduction techniques. Topics include: terminology and basic theory of measurement uncertainty, techniques for assessing uncertainty sources, and basic data analysis and data reduction strategies to include fit parameter uncertainty assessment. A major component of the course is a class project where each student applies the methods learned to a measurement relevant to their thesis or dissertation research project where possible.

MEGR 7187. Flexures. (3) Cross-listed Course(s): MEGR 8187. Compliance terms and stresses in leaf and notch type flexures. Rotationally symmetric flexures. Application of Rayleigh's method to estimate resonant frequencies of simple structural elements. Dynamics, design, and manufacture of flexure mechanisms.

MEGR 7191. Introduction to Optical Fabrication and Testing. (3)

Cross-listed Course(s): MEGR 8191. Optical elements and their application; optical materials and materials specifications (homogeneity, striae, birefringence), specifications for optical elements (figure, mid-spatial frequencies, finish), optical drawings (ISO 10110), coatings, fabrication methods for flats and spheres, aspheric fabrication, small tool and computer controlled polishing, interferometric measurement of form and finish, other test methods.

MEGR 7213. Introduction to Computational Fluid

Dynamics. (3) Cross-listed Course(s): MEGR 8213. Introductory topics in Computational Fluid Dynamics, including mathematical properties of governing equations, fundamentals of discretization, finite difference and finite

volume methods, turbulence modeling, and grid generation.

MEGR 7214. Turbulent Shear Flows. (3) Cross-listed Course(s): MEGR 8214. Most of the flows of engineering importance are turbulent flows. This course provides students with the insight required to analyze, investigate, and explain turbulent fluid flows. Topics include: dimensional analysis, the Reynolds equations, elements of the kinetic theory of gases, estimates of the Reynolds Stress, dynamics of turbulence, boundary free shear flows, and wall-bounded shear flows.

MEGR 7215. Turbulence Modeling and Simulations. (3) Cross-listed Course(s): MEGR 8215. Comprehensive overview of turbulence modeling and simulations. Introduction to the mathematical framework needed to understand turbulence model formulations. Basic principles of turbulence modeling and the limitations of the commonly used modeling approaches, and analysis of turbulent flows using single-point closure modeling.

MEGR 7221. Vibration of Discrete and Continuous Systems. (3) Cross-listed Course(s): MEGR 8221. Topics include: single degree of freedom free and forced vibrations; two degree of freedom free and forced vibration; modal analysis; measurement methods; continuous beam modeling; and receptance coupling.

MEGR 7222. Mechatronics. (3) Cross-listed Course(s): MEGR 8222. An approach aiming at the synergistic integration of mechanics, electronics, control theory, and computer science within product design and manufacturing, in order to improve and/or optimize its functionality.

MEGR 7223. Mathematical Concepts for Dynamics and Control. (3) Cross-listed Course(s): MEGR 8223. Surveys aspects of abstract linear algebra and functional analysis that commonly arise in the formulation and study of problems in dynamics and control. Students are expected to be familiar with basic calculus and ordinary differential equations.

MEGR 7224. Analytical Mechanics. (3) Cross-listed Course(s): MEGR 8224. Surveys foundations of classical mechanics with an emphasis on Lagrangian and Hamiltonian formalism, including an introduction to underlying concepts from differential geometry. Students are expected to be familiar with linear vector spaces and multivariable calculus.

MEGR 7225. Linear Systems Theory. (3) Cross-listed Course(s): MEGR 8225, ECGR 6111, ECGR 8111. Analysis, simulation, and control design for mechanical and electrical systems modeled by linear state-space equations, including robotic and mechatronic systems, aerospace and ground

vehicles, and circuits. Review of linear algebra, linearization, linear time-invariant state-space models, matrix transfer functions, state equation solutions (uniqueness/existence), state transition matrices, stability criteria, observability, controllability, realizations, similarity transforms, canonical forms, state feedback by eigenvalue-placement, numerical simulations and controller implementation in MATLAB. *Credit will not be given for MEGR 7225 where credit has been given for MEGR 8225, or ECGR 6111 or ECGR 8111.*

MEGR 7226. Optimal Control Theory. (3) Cross-listed Course(s): MEGR 8226, ECGR 6115, ECGR 8115. Optimization-based control of state-space dynamical systems with applications to electrical and mechanical engineering, including robotic and mechatronic systems, aerospace and ground vehicles, and circuits. Constrained and unconstrained parameter optimization. Hamilton-Jacobi-Bellman equation and dynamic programming. Optimal feedback control via the linear quadratic regulator. Calculus of variations and Pontryagin's minimum principle. Time-permitting the course may include an introductory overview of advanced topics such as numerical methods for optimal control, stochastic optimal control, model-predictive control, and differential games. *Credit will not be given for MEGR 7226 where credit has been given for MEGR 8226, or ECGR 6115 or ECGR 8115.*

MEGR 7283. Advanced Coordinate Metrology. (3) Cross-listed Course(s): MEGR 8283. Error compensation of coordinate measuring machines, algorithms and sampling methods used in data analysis. Probing systems, compensation of probing errors. Scanning coordinate measuring machines and their dynamic behavior. Performance testing of coordinate measuring machines. Credit will not be awarded for MEGR 7283 where credit has been awarded for MEGR 8283.

MEGR 7284. Advanced Surface Metrology. (3) Cross-listed Course(s): MEGR 8284, OPTI 6384, and OPTI 8384. Constituents of surface texture, stylus, optical, atomic force microscope and other advanced methods of measuring surface texture. Two and three dimensional measurement of surfaces. Separation of form, waviness and roughness. Random process analysis techniques, use of transforms for filtering. Numerical evaluation of surface texture. Use of surface texture as fingerprint of the process. Relationship between function and surface texture. Credit will not be awarded for MEGR 7284 where credit has been awarded for MEGR 8284.

MEGR 7290. Battery Electrochemistry. (3) Cross-listed Course(s): MEGR 8290. Introduction to the fundamentals of electrochemistry, including electrochemical theory, double layer modeling and electrochemical methods. Additionally, important electrochemical applications,

especially batteries, will be discussed, including corrosion, energy production and storage, and sensors (biosensors). Students will have the chance to collect electrochemical data using relevant equipment.

MEGR 7291. Battery Management and Control. (3) Cross-listed Course(s): MEGR 8291. General review of nonlinear dynamic systems to setup models for battery state estimation. Electrochemical modeling of battery charge/discharge cycles and degradation aging using Kalman Filter and other state estimation and machine learning techniques.

MEGR 7380. Tribology. (3) Cross-listed Course(s): MEGR 8380. Surface properties and study of surfaces in contact. Friction and wear of materials. Tribological properties of solid materials. Fluid lubricated journal bearings, lubrication of highly loaded contacts, lubricating systems and bearing selection. Credit will not be awarded for MEGR 7380 where credit has been awarded for MEGR 8380.

MEGR 7480. Advanced Manufacturing Processes and Equipment. (3) Cross-listed Course(s): MEGR 8480. Prerequisite(s): permission of department. Detailed analytical treatment of manufacturing materials and processes. Forming processes (forging, extrusion, rolling, drawing, bending, shearing), casting processes, metal cutting processes (turning, boring, drilling, shaping, milling), tool materials, joining processes, automation. Credit will not be awarded for MEGR 7480 where credit has been awarded for MEGR 8480.

MEGR 7892. Individual Study and Projects. (1 to 6) Cross-listed Course(s): MEGR 8892. Individual investigation and exposition of results. *May be repeated for credit.*

MEGR 7955. Graduate Design I. (3) First of a two-semester sequence leading to a major integrative experience in applying the principles of design and project management to the design of a major mechanical engineering system. Teamwork and communication skills are emphasized.

MEGR 7956. Graduate Design II. (3) Prerequisite(s): MEGR 7955 with grade of C or above. Second of a two-semester sequence leading to a major integrative experience in applying the principles of design and project management to the design of a major mechanical engineering system. Teamwork and communication skills are emphasized.

MEGR 7991. Graduate Master Thesis Research. (1 to 6) Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

MEGR 8000. Research Seminar. (1) Presentations on the current research in Mechanical Engineering, Engineering Science, and related fields. Required for all doctoral students in the MEES program. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

MEGR 8090. Special Topics in Mechanical Engineering. (3) Directed study of current topics of special interest for Ph.D. degree. *May be repeated for credit.*

MEGR 8099. Special Topics in Battery Engineering. (3) Cross-listed Course(s): MEGR 7099. Builds upon and synthesizes the knowledge that the students have gained from the mechanical engineering core curriculum. The specific topics covered in each separate offering of the course will broaden and deepen students' knowledge in areas including battery failure analysis, battery recycling, new advances of raw materials (cathode, anode, electrolyte, separator), battery manufacturing and design, and applications to electrical vehicles, cellphone, energy storage system, etc. *May be repeated for credit with change of topic.*

MEGR 8104. Fabrication of Nanomaterials. (3) Cross-listed Course(s): ECGR 7104 and MEGR 7104. Prerequisite(s): NANO 8101 or permission of instructor. Lithographic methods (CVD, PVD, e-beam, ion beam, magnetron, evaporation, spin coating, mask fabrication, developing resists); microelectromechanical systems and nanoelectromechanical systems; limits of conventional mechanical processing, electroforming, growth mechanisms (organic, inorganic, thermal); powders. Credit will not be awarded for MEGR 8104 where credit has been awarded for ECGR 7104 or MEGR 7104.

MEGR 8108. Finite Element Analysis and Applications. (3) Cross-listed Course(s): MEGR 7108. An introduction to the finite element method and its application to engineering problems. Application of the displacement methods to plane stress, plane strain, plate bending and axisymmetrical bodies. Topics may include but are not limited to: dynamics, heat conduction, and structural mechanics. Credit will not be awarded for MEGR 8108 where credit has been awarded for MEGR 7108.

MEGR 8110. Advanced Conductive Heat Transfer. (3) Cross-listed Course(s): MEGR 8110. Prerequisite(s): MEGR 3116. Theory of steady and unsteady heat conduction in isotropic and anisotropic media. Treatment of concentrated and distributed heat sources. Application of the finite difference and finite element methods. Credit will not be awarded for MEGR 8110 where credit has been awarded for MEGR 7110.

MEGR 8113. Dynamics and Thermodynamics of Compressible Flow. (3) Cross-listed Course(s): MEGR 7113. Compressible flow equations, isentropic flow, normal

shock waves, Fanno and Rayleigh line flows. Nonsteady one dimensional flow. Credit will not be awarded for MEGR 8113 where credit has been awarded for MEGR 7113.

MEGR 8114. Advanced Fluid Mechanics. (3) Cross-listed Course(s): MEGR 7114. Unified tensorial-theoretical treatment of the transport of mass, momentum, energy and vorticity in fluids. General theorems for inviscid and irrational flows. Viscous effects, boundary layer theory, nonlinear phenomena hydrodynamic instability and turbulence with applications. Credit will not be awarded for MEGR 8114 where credit has been awarded for MEGR 7114.

MEGR 8115. Convective Heat Transfer. (3) Cross-listed Course(s): MEGR 7115. Prerequisite(s): MEGR 3116 and MEGR 4112. Heat and momentum transfer prediction in channel flows and boundary layers. Differential equation methods for fully developed and entry length laminar tube flows. Similarity solution for laminar heat transfer. Superposition methods for non-uniform boundary conditions. Integral equations of the boundary layer, approximate and semiempirical methods of solution. Credit will not be awarded for MEGR 8115 where credit has been awarded for MEGR 7115.

MEGR 8117. Statistical Thermodynamics. (3) Cross-listed Course(s): MEGR 7117. Quantum mechanics-based statistical mechanics. Equilibrium macroscopic and microscopic thermodynamic states. Ensemble theory, including classical phase spaces, Liouville theorem, quantum modifications, and Gibbs microcanonical, canonical, and grand canonical ensembles. Introduction to quantum mechanics, including Hamiltonian systems, the density matrix, and quantum statistics. Theory of ideal quantum gases and non-interacting Boson and Fermi-Dirac systems.

MEGR 8119. Thermal Applications in Biomedical Engineering. (3) Cross-listed Course(s): MEGR 7119. Prerequisite(s): permission of department. Application of thermodynamic and heat transfer principles to the analysis of biomedical systems. Topics include: thermodynamic and transport properties of biological tissue, thermoregulation, design and use of cryosurgical probes, and numerical modeling methods. Credit will not be awarded for MEGR 8119 where credit has been awarded for MEGR 7119.

MEGR 8129. Structural Dynamics of Production Machinery. (3) Cross-listed Course(s): MEGR 7129. Prerequisite(s): permission of department. The analytical study of dynamic characteristics of production machinery and the corresponding measurement, specification, and effects on machine performance. Machine tool vibration, machine tool stability, high speed machining. Credit will not be

awarded for MEGR 8129 where credit has been awarded for MEGR 7129.

MEGR 8130. Introduction to Control Systems. (3) Cross-listed Course(s): MEGR 7130. Introduction to key principles behind feedback control, including closed-loop time domain and frequency domain analysis, root locus design, state feedback, robustness margins, and loop shaping.

MEGR 8131. Automotive Power Plants. (3) Cross-listed Course(s): MEGR 7131. Energy analysis of internal and external combustion engines for vehicular propulsion. Thermodynamic principles for combustion efficient use of fuel combustion, different types of fuel use, and pollutant control.

MEGR 8132. Advanced Automotive Power Plants. (3) Cross-listed Course(s): MEGR 7132. Prerequisite(s): MEGR 7131 or MEGR 8131. Follow-up course to Automotive Power Plants. Topics include: combustion, thermodynamic efficiency, fuel efficiency, torque and power, emissions, etc.

MEGR 8133. Applied Vehicle Aerodynamics. (3) Cross-listed Course(s): MEGR 7133. Prerequisite(s): Foundational knowledge of fluid mechanics and numerical methods in engineering applications. Flow of air around streamlined and bluff bodies, aerodynamic forces, understanding flow separation and reattachments, aerodynamic tools, introduction to computational fluid dynamics, use of commercial CFD packages to solve fluid flow problems, computer simulation and analysis of flow around bluff bodies and road vehicles including racecars.

MEGR 8134. Advanced Road Vehicle Dynamics. (3) Cross-listed Course(s): MEGR 7134. Prerequisite(s): MEGR 3121, MEGR 3122, and MATH 2171. Advanced topics related to vehicle dynamics and modeling. Acceleration and braking performance, road loads, steady-state cornering, suspension, steering system, and tire behavior are explored.

MEGR 8135. Advanced Tire Mechanics. (3) Cross-listed Course(s): MEGR 7135. Prerequisite(s): MEGR 2144 and MEGR 3121 with grades of C or above. In-depth analysis of the tire and its influence on vehicle performance, including: design, materials, construction, structural response, rolling resistance, force and moment generation, NVH, wet and dry traction, wear, high speed limit, and standards. Tire models, their limitations, and their governing equations. Graduate students develop an experiment (in addition to a literature review), gather data, submit an abstract to the Fall Tire Society Conference, and write a rough draft of a paper.

MEGR 8136. Automotive Materials. (3) Cross-listed Course(s): MEGR 7136. A broad range of automotive

materials from steel, aluminum to new materials, such as composite materials. During the class, students are tutored to understand how the industry selects, designs, manufactures, and applies materials for automobiles in general, and what are current applications of various available materials in the automotive industry. Emphasis on structural materials where crashworthiness and structural integrity are important. Basic understanding of mechanics of materials; e.g., Introduction of Solid Mechanics, Introduction of Material Engineering, Mechanics of Materials.

MEGR 8141. Theory of Elasticity I. (3) Cross-listed Course(s): MEGR 6141. Introduction to the theory of elastic media; the fundamentals of stress, strain, stress-strain relationships, compatibility and equilibrium. Applications to two- and three-dimensional problems. Structural mechanics and energy methods. Credit will not be awarded for MEGR 8141 where credit has been awarded for MEGR 6141.

MEGR 8142. Theory of Elasticity II. (3) Cross-listed Course(s): MEGR 7142. Topics include coupled material behavior, variational methods, numerical techniques. Credit will not be awarded for MEGR 8142 where credit has been awarded for MEGR 7142.

MEGR 8143. Inelastic Behavior of Materials. (3) Cross-listed Course(s): MEGR 7143. Prerequisite(s): MEGR 8141 or permission of department. Introduction to plasticity and linear viscoelasticity. Topics include: a study of yield criteria, plastic stress-strain relations, plastic hinge analysis, discrete viscoelastic models, the hereditary integral and selected boundary value problems. Credit will not be awarded for MEGR 8143 where credit has been awarded for MEGR 7143.

MEGR 8145. Advanced Topics in Dynamics. (3) Cross-listed Course(s): MEGR 7145. Selected advanced topics in dynamics such as Lagrangian dynamics, vibrations of continuous media, stress wave propagation, and motion measurement. Credit will not be awarded for MEGR 8145 where credit has been awarded for MEGR 7145.

MEGR 8151. Orthopedic Biomechanics. (3) Cross-listed Course(s): MEGR 7151. Prerequisite(s): Permission of instructor. Introduces mechanical properties of the human body's hard tissues (bone and cartilage) and soft tissues (ligament and tendon). Focus is placed on mechanical and biological considerations for treatment of orthopedic diseases and sports injuries, such as fracture, ACL injury, and osteoarthritis. Students learn how to solve medical problems using their engineering knowledge and skills, such as finite element analysis and inverse dynamics.

MEGR 8152. Mechanics of the Human Locomotor System. (3) Cross-listed Course(s): MEGR 7152. Prerequisite(s): Permission of instructor. Introduces dynamic analysis of the

human musculoskeletal system. Students learn to develop 3-D rigid body models of human movement, calculate internal forces in muscles and joints during daily and sports activities, and how to use motion capture system and simulation software of human locomotion.

MEGR 8163. Materials Characterization and Analysis. (3) Cross-listed Course(s): MEGR 7163. Designed for graduate students to gain an in-depth understanding of principal methods in materials characterization and analysis. Students learn different techniques of materials characterization and analysis, including: (1) structure identification using electron and X-ray diffractions, (2) morphology study using electron microscopy, (3) composition and chemical state determination using electron spectroscopy and other techniques. Focuses on fundamental concepts of different methods, as well as hands-on experience. Well-designed lab sessions are provided for students to practice selected techniques using different instruments (e.g., XRD, SEM, EDS, and sputtering coating).

MEGR 8166. Mechanical Behavior of Materials I. (3) Cross-listed Course(s): MEGR 6166. Macroscopic and microscopic aspects of elastic and plastic deformation and fracture of engineering materials; applications of dislocation theory to an interpretation and control of mechanical properties; temperature, strain rate and texture effects. Credit will not be awarded for MEGR 8166 where credit has been awarded for MEGR 6166.

MEGR 8169. Introduction to Transmission Electron Microscopy. (3) Cross-listed Course(s): MEGR 7169. Designed for graduate students with various academic backgrounds, including engineering, nanoscale science, physics, chemistry, and biology. Introduces the theoretical and practical concepts of transmission electron microscopy (TEM). Topics include: basic instrumentation of TEM, diffraction, imaging, and microanalysis. In addition to classroom lectures, students have opportunities to gain hands-on experience of operating a state-of-the-art TEM system and several sample preparation tools. The course consists of weekly lectures and weekly lab sections. The final grade is determined based on homework, lab reports, and examinations.

MEGR 8170. Fracture Mechanics. (3) Cross-listed Course(s): MEGR 7170. Fracture Mechanics is a specialized field of study that focuses on the behavior of materials under loading conditions that lead to the propagation of cracks. This course aims to provide graduate students with a comprehensive understanding of the fundamental principles, theories, and practical applications of fracture mechanics. The course will cover topics such as stress analysis, crack propagation, energy release rate, fracture toughness, and failure criteria. Through lectures and assignments, students will develop the necessary skills to

analyze and predict the behavior of materials in the presence of cracks and apply fracture mechanics principles to solve real-world engineering problems.

MEGR 8171. Phase Transformation in Solids. (3) Cross-listed Course(s): MEGR 7171. Phase transformation commonly occurs during materials manufacturing (e.g., additive manufacturing), processing and in service. This course lays a foundation for understanding phase transformation in terms of thermodynamics and kinetics, as well as transformation mechanisms down to the atomic scale. Special topics on phase transformation during additive manufacturing will also be included.

MEGR 8172. Computational Methods in Engineering. (3) Cross-listed Course(s): MEGR 7172. Numerical linear algebra, solution of systems of equations, numerical integration, differentiation and interpolation, root finding, numerical solution of partial differential equations by finite difference and finite element methods. Credit will not be awarded for MEGR 8172 where credit has been awarded for MEGR 7172.

MEGR 8173. Engineering Design Optimization. (3) Cross-listed Course(s): MEGR 7173. Prerequisite(s): Permission of instructor and programming knowledge in C, C++, FORTRAN, or Matlab. Concepts of optimization and associated terminology. Proper optimization formulation and application in engineering design. Methods for simulation-based optimization with approximation techniques. Credit will not be awarded for MEGR 7173 where credit has been awarded for MEGR 8173.

MEGR 8174. Engineering Analysis I. (3) Cross-listed Course(s): MEGR 7174. An overview of Ordinary Differential Equations, Partial Differential Equations, Fourier series, and Laplace Transforms.

MEGR 8175. Engineering Analysis II. (3) Cross-listed Course(s): MEGR 7175. An overview of Linear Algebra, including Matrix-Matrix operations, types of matrices, Gaussian Elimination, Rank of a Matrix, Eigenvalues and Eigenvectors, Singular Value Decomposition, Approximations of Functions with Fourier Series, Discrete Fourier Transform, Hankel Transform, Orthogonal Polynomials.

MEGR 8181. Engineering Metrology. (3) Cross-listed Course(s): MEGR 6181, OPTI 6381, and OPTI 8381. Prerequisite(s): MEGR 3282 or equivalent. Introduction to metrology and standards. Uncertainty, precision and accuracy in metrology. Measurement of size and form, computational methods in measurement of form. Measurement of surface texture and out of roundness. Machine tool and robot accuracy and calibration. Evaluation of screw threads and gears. Introduction to design of precision instruments. Credit will not be awarded

for MEGR 8181 where credit has been awarded for MEGR 6181.

MEGR 8182. Machine Tool Metrology. (3) Cross-listed Course(s): MEGR 7182. Machine tool accuracy and performance testing. Modeling and measurement of volumetric accuracy using parametric error separation and quasi-static error models. Use of homogeneous transformations for error mapping. Linear and higher order thermal models. Error budgeting and management. Axis of rotation metrology, spindle accuracy, and cutting performance tests. Laboratory experience on CNC machine tools using heterodyne laser interferometers, capacitance gages, and other computer assisted sensor systems for machine checking. Credit will not be awarded for MEGR 8182 where credit has been awarded for MEGR 7182.

MEGR 8183. Design of Precision Machines and Instrument I. (3) Cross-listed Course(s): MEGR 7183. Basic patterns in the design of precision machines and instruments. Design process, error assessment and examples, materials, sensors, drives, and controls for precision machines. Machine frames, sliding and rolling element bearings, flexures, hydrostatic bearings. Design methodology, analysis of potential design, design case studies, and modeling of design alternatives. Credit will not be awarded for MEGR 8183 where credit has been awarded for MEGR 7183.

MEGR 8185. Gear Manufacturing and Metrology. (3) Cross-listed Course(s): MEGR 7185. Fundamentals of manufacturing techniques (e.g., turning, milling, grinding, honing), including the corresponding tools and machine tools. Fundamental knowledge about design, machine components, and tolerances. Introduces the basic knowledge about metrology and standards, statistics, measurement uncertainty, calibration; measurement of geometric quantities (size, form, surface texture). Mathematics, namely elementary vector analysis, approximation algorithms are studied.

MEGR 8186. Data Analysis and Uncertainty. (3) Cross-listed Course(s): MEGR 7186. Intended for graduate students from science and engineering disciplines, with a focus on optical engineering and mechanical engineering. Introduces the principles of measurement uncertainty assessment, uncertainty analysis methodologies, and data analysis/reduction techniques. Topics include: terminology and basic theory of measurement uncertainty, techniques for assessing uncertainty sources, and basic data analysis and data reduction strategies to include fit parameter uncertainty assessment. A major component of the course is a class project where each student applies the methods learned to a measurement relevant to their thesis or dissertation research project where possible.

MEGR 8187. Flexures. (3) Cross-listed Course(s): MEGR 7187. Compliance terms and stresses in leaf and notch type flexures. Rotationally symmetric flexures. Application of Rayleigh's method to estimate resonant frequencies of simple structural elements. Dynamics, design, and manufacture of flexure mechanisms.

MEGR 8191. Introduction to Optical Fabrication and Testing. (3) Cross-listed Course(s): MEGR 7191. Optical elements and their application; optical materials and materials specifications (homogeneity, striae, birefringence), specifications for optical elements (figure, mid-spatial frequencies, finish), optical drawings (ISO 10110), coatings, fabrication methods for flats and spheres, aspheric fabrication, small tool and computer controlled polishing, interferometric measurement of form and finish, other test methods.

MEGR 8213. Introduction to Computational Fluid Dynamics. (3) Cross-listed Course(s): MEGR 7213. Introductory topics in Computational Fluid Dynamics, including mathematical properties of governing equations, fundamentals of discretization, finite difference and finite volume methods, turbulence modeling, and grid generation.

MEGR 8214. Turbulent Shear Flows. (3) Cross-listed Course(s): MEGR 7214. Most of the flows of engineering importance are turbulent flows. This course provides students with the insight required to analyze, investigate, and explain turbulent fluid flows. Topics include: dimensional analysis, the Reynolds equations, elements of the kinetic theory of gases, estimates of the Reynolds Stress, dynamics of turbulence, boundary free shear flows, and wall-bounded shear flows.

MEGR 8215. Turbulence Modeling and Simulations. (3) Cross-listed Course(s): MEGR 7215. Comprehensive overview of turbulence modeling and simulations. Introduction to the mathematical framework needed to understand turbulence model formulations. Basic principles of turbulence modeling and the limitations of the commonly used modeling approaches, and analysis of turbulent flows using single-point closure modeling.

MEGR 8221. Vibration of Discrete and Continuous Systems. (3) Cross-listed Course(s): MEGR 7221. Topics include: single degree of freedom free and forced vibrations; two degree of freedom free and forced vibration; modal analysis; measurement methods; continuous beam modeling; and receptance coupling.

MEGR 8222. Mechatronics. (3) Cross-listed Course(s): MEGR 7222. An approach aiming at the synergistic integration of mechanics, electronics, control theory, and computer science within product design and

manufacturing, in order to improve and/or optimize its functionality.

MEGR 8223. Mathematical Concepts for Dynamics and Control. (3) Cross-listed Course(s): MEGR 7223. Surveys aspects of abstract linear algebra and functional analysis that commonly arise in the formulation and study of problems in dynamics and control. Students are expected to be familiar with basic calculus and ordinary differential equations.

MEGR 8224. Analytical Mechanics. (3) Cross-listed Course(s): MEGR 7224. Surveys foundations of classical mechanics with an emphasis on Lagrangian and Hamiltonian formalism, including an introduction to underlying concepts from differential geometry. Students are expected to be familiar with linear vector spaces and multivariable calculus.

MEGR 8225. Linear Systems Theory. (3) Cross-listed Course(s): MEGR 7225, ECGR 6111, ECGR 8111. Analysis, simulation, and control design for mechanical and electrical systems modeled by linear state-space equations, including robotic and mechatronic systems, aerospace and ground vehicles, and circuits. Review of linear algebra, linearization, linear time-invariant state-space models, matrix transfer functions, state equation solutions (uniqueness/existence), state transition matrices, stability criteria, observability, controllability, realizations, similarity transforms, canonical forms, state feedback by eigenvalue-placement, numerical simulations and controller implementation in MATLAB. *Credit will not be given for MEGR 8225 where credit has been given for MEGR 8225, or ECGR 6111 or ECGR 8111.*

MEGR 8226. Optimal Control Theory. (3) Cross-listed Course(s): MEGR 7226, ECGR 6115, ECGR 8115. Optimization-based control of state-space dynamical systems with applications to electrical and mechanical engineering, including robotic and mechatronic systems, aerospace and ground vehicles, and circuits. Constrained and unconstrained parameter optimization. Hamilton-Jacobi-Bellman equation and dynamic programming. Optimal feedback control via the linear quadratic regulator. Calculus of variations and Pontryagin's minimum principle. Time-permitting the course may include an introductory overview of advanced topics such as numerical methods for optimal control, stochastic optimal control, model-predictive control, and differential games. *Credit will not be given for MEGR 8226 where credit has been given for MEGR 7226, or ECGR 6115 or ECGR 8115.*

MEGR 8283. Advanced Coordinate Metrology. (3) Cross-listed Course(s): MEGR 7283. Error compensation of coordinate measuring machines, algorithms and sampling methods used in data analysis. Probing systems,

compensation of probing errors. Scanning coordinate measuring machines and their dynamic behavior. Performance testing of coordinate measuring machines. Credit will not be awarded for MEGR 8283 where credit has been awarded for MEGR 7283.

MEGR 8284. Advanced Surface Metrology. (3) Cross-listed Course(s): MEGR 7284, OPTI 6384, and OPTI 8384. Constituents of surface texture, stylus, optical, atomic force microscope and other advanced methods of measuring surface texture. Two and three dimensional measurement of surfaces. Separation of form, waviness and roughness. Random process analysis techniques, use of transforms for filtering. Numerical evaluation of surface texture. Use of surface texture as fingerprint of the process. Relationship between function and surface texture. Credit will not be awarded for MEGR 8284 where credit has been awarded for MEGR 7284.

MEGR 8290. Battery Electrochemistry. (3) Cross-listed Course(s): MEGR 7290. Introduction to the fundamentals of electrochemistry, including electrochemical theory, double layer modeling and electrochemical methods. Additionally, important electrochemical applications, especially batteries, will be discussed, including corrosion, energy production and storage, and sensors (biosensors). Students will have the chance to collect electrochemical data using relevant equipment.

MEGR 8291. Battery Management and Control. (3) Cross-listed Course(s): MEGR 7291. General review of nonlinear dynamic systems to setup models for battery state estimation. Electrochemical modeling of battery charge/discharge cycles and degradation aging using Kalman Filter and other state estimation and machine learning techniques.

MEGR 8380. Tribology. (3) Cross-listed Course(s): MEGR 7380. Surface properties and study of surfaces in contact. Friction and wear of materials. Tribological properties of solid materials. Fluid lubricated journal bearings, lubrication of highly loaded contacts, lubricating systems and bearing selection. Credit will not be awarded for MEGR 8380 where credit has been awarded for MEGR 7380.

MEGR 8480. Advanced Manufacturing Processes and Equipment. (3) Cross-listed Course(s): MEGR 7480. Prerequisite(s): permission of department. Detailed analytical treatment of manufacturing materials and processes. Forming processes (forging, extrusion, rolling, drawing, bending, shearing), casting processes, metal cutting processes (turning, boring, drilling, shaping, milling), tool materials, joining processes, automation. Credit will not be awarded for MEGR 8480 where credit has been awarded for MEGR 7480.

MEGR 8892. Individual Study and Projects. (1 to 6) Cross-listed Course(s): MEGR 7892. Individual investigation and exposition of results. *May be repeated for credit.*

MEGR 8990. Industrial Internship. (1 to 3) Cross-listed Course(s): MEGR 6990. Prerequisite(s): Completion of nine hours of graduate coursework. Full- or part-time academic year internship in engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by their graduate program director. Requires a mid-term report and final report to be graded by the supervising faculty.

MEGR 8999. Doctoral Dissertation Research. (1 to 9) Individual investigation culminating in the preparation and presentation of a doctoral dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Fire Protection and Safety Management (MFPA)

MFPA 5132. Fire and Building Codes, Standards, and Practices. (3) Prerequisite(s): ETFS 3103 or permission of department. History of fire safety regulation development; building fire characteristics, fire test methods, and fire safety of buildings and structures; contemporary building and fire codes, practices, and their enforcement.

MFPA 5144. Fire Protection Systems. (3) Prerequisite(s): ETFS 3103, ETFS 3113, or permission of department. An advanced study of various fire protection systems in regard to contemporary fire and life safety problems. Topics include: process of fire and smoke development, principles of active fire suppression and detection systems, hydraulics, automatic sprinkler systems, passive fire protection systems, structural fire resistance, installation and maintenance of fire protection systems.

MFPA 5150. Human Resources Management in Emergency Services. (3) Cross-listed Course(s): MPAD 6134. Prerequisite(s): permission of department. A study of the context of public personnel fire/emergency services related administration; basic functions of job evaluation and compensation, employee rights and responsibilities; the legal constraints including equal opportunity, health and safety, collective bargaining; government productivity.

MFPA 5223. Industrial Safety and Facilities Management. (3) Prerequisite(s): ETFS 3123 or permission of department. Investigation and analysis of hazard control principles relating to the management of personnel, facilities, and equipment, including control procedures, work-task

analysis, risk identification and countermeasures, safety training, and pertinent safety management techniques.

MFPA 5321. Community Threat Assessment and Mitigation. (3) Cross-listed Course(s): ETFS 4123. Focuses on the emergency service's responsibility while conducting major operations involving multi-alarm units, and natural and man-made disasters that may require interagency or jurisdictional coordination. Emphasis is on threat assessment and mitigation strategies of potential large-scale disasters including but not limited to earthquakes, hurricanes, terrorism, hazardous materials releases, tornadoes, and floods. Topics include: fire-ground decision making, advanced incident command, command and control, safety, personnel accountability, hazard preparedness, mitigation, response, recovery, evacuation, sheltering, and communications.

MFPA 5323. Advanced Fire Service Administration. (3) Cross-listed Course(s): ETFS 4323. A study of management theories, leadership philosophies and strategies for the fire service. Emphasis will be on planning, organizing staffing, and evaluating fire protection services. Public fire education, loss prevention principles, and management of resources particular to fire and emergency services are addressed. Discussion of techniques for assessment of public fire protection and its impact on the community and environment.

MFPA 6000. Special Topics in Fire Protection and Safety Management. (3) Prerequisite(s): Permission of department. Examination of specific new and emerging areas in the fields of fire protection and safety management. *May be repeated for credit.*

MFPA 6103. Fire Dynamics. (3) Prerequisite(s): ETME 3143 and ETME 3244, or permission from the department. Introduces students to fundamentals of fire and combustion and is intended to serve as the first exposure to fire dynamics phenomena. Includes fundamental topics in fire and combustion such as thermodynamics of combustion, fire chemistry, premixed and diffusion flames, solid burning, ignition, plumes, heat release rate curves, and flame spread.

MFPA 6113. Fire Failure Analysis. (3) Prerequisite(s): MFPA 6103 or permission of department. Provides knowledge for the development of fire investigation and reconstruction as a basis for determining fire cause and origin and evaluating and improving fire safety design. Accident investigation theory and failure analysis techniques such as fire re-creation testing and modeling are presented.

MFPA 6120. Public and Private Sector Interoperability. (3) Cross-listed Course(s): MPAD 6290. Prerequisite(s): Permission of department. A study of multi-agency interoperability and the effective organization and

management of emergency resources at various fire and large-scale emergency incidents. Includes a review of national standards and federal regulations impacting emergency incident management. Case studies of actual and theoretical incidents will be used to reinforce command and control concepts.

MFPA 6123. Human Behavior in Fire. (3) Prerequisite(s): ETFS 3103 and ETFS 3113, or permission of department. Individual decision processes and behavior, modeling of people movement, calculation methods for egress prediction, egress design, and fire safety signs and alarm systems.

MFPA 6124. Fire Service and the Community. (3) Prerequisite(s): Permission of department. Theoretical concepts of public service to build an understanding of how the fire service fits within the community.

MFPA 6126. Arson. (3) Prerequisite(s): Permission of department. Utilizes lecture and case studies of arson fires that were started for various reasons, including financial gain, revenge and to conceal other crimes. The criminal intent and the psychological aspects of the fire setter are discussed.

MFPA 6203. Fire Modeling. (3) Prerequisite(s): MFPA 6103 or permission from the department. Modeling of compartment fire behavior is studied through the use and application of two types of models: zone and field. The zone model studied is CFAST. The field model studied is FDS. Focus on the understanding of each of these models is the primary objective in terms of needed input, interpretation of output and limitations.

MFPA 6232. Structural Fire Safety. (3) Prerequisite(s): ETGR 2102 or ETME 3123, ETME 3244, or permission of department. Provides the knowledge needed for structural fire safety design and analysis. Course topics include design philosophies and methods in fire safety engineering, principles of and approaches for structural design for fire safety, behavior of compartment fires, behavior of structural materials in fire, and structural fire safety of typical materials and their components.

MFPA 6233. Performance-Based Design. (3) Prerequisite(s): ETFS 6203 or permission of department. Practical applications of fire protection engineering principles to the design of buildings. Both compartmented and non-compartmented buildings will be designed for criteria of life safety, property protection, continuity of operations, operational management and cost.

MFPA 6243. Research Investigation. (3) Prerequisite(s): permission of the department. Opportunities in conducting research to tackle fire safety related real-world problems. With guidance from the instructor, students can work individually or as a team on a one-semester project.

MFPA 6244. Fire Detection and Smoke Management. (3) Prerequisite(s): ETFS 3103 or permission of department. Addresses the fundamentals and practices of fire detection and smoke management. Topics include: principles of fire detection, fire alarm technology, and contemporary fire detection and alarm systems; principles applicable to the design and analysis of smoke management systems; factors affecting smoke movement; smoke hazard assessment; airflow in buildings, performance characteristics of smoke control and management systems.

MFPA 6252. Law and Fire Safety. (3) Prerequisite(s): Permission of department. Responding to natural and manufactured building hazards requires a complex legal environment, including regulation and liability. Key topics include the use of model codes, administrative regulation, retrospective codes, federal preemption, arson, performance based codes, risk based regulation, engineering malpractice, product liability and disaster investigation.

MFPA 6270. Budgeting, Grants, Contracts and Finance in Emergency Services. (3) Prerequisite(s): Permission of department. Develops the understanding of strategic planning, contracting and budgeting practices as well as grant proposal writing with the emphasis on contract administration skills necessary to operation of a functioning governmental entity.

MFPA 6800. Independent Study. (1 to 3) Prerequisite(s): Permission of department. The MFPA program offers independent study and special study courses to allow students to pursue studies in areas for which there are no approved formal courses. *Graded on a Pass/Unsatisfactory basis.* Special study courses can be taken for a grade if the paperwork indicates it will be taken A/F. Each requires a title, justification, and the method of evaluation. Courses taken for A/F grade may be used to satisfy degree requirements. *May be repeated for credit.*

MFPA 6900. Thesis. (1 to 6) Prerequisite(s): Permission of graduate committee advisor. Individual investigation culminating in the preparation and presentation of a thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

Public Administration (MPAD)

MPAD 6000. Topics for Graduate Study in Public Administration. (1 to 4) Intensive study of a topic in public administration. The topic of investigation may vary from semester to semester. *May be repeated for credit.*

MPAD 6102. Foundations in Public Administration. (3) Pre- or Corequisite(s): POLS 1110 or its equivalent, and admission into MPAD Program. Consideration of the political context of contemporary public administration, with attention to the role of administration in the policy process, the legal basis for public administration, legislative-executive relations, and accountability, ethics, and responsibility in democratic administration.

MPAD 6104. Public Organizations and Management. (3) Pre- or Corequisite(s): Admission into MPAD Program. Changing images of people, organizations and organizational environments; research findings and applications related to organization structure, motivation, leadership, communications, decision-making, group dynamics, interpersonal skills; ethics and values important to the study and practice of organizational leadership; and assessment of value systems and the impact of competing value systems on public and organizational policy making.

MPAD 6125. Research Methods for Public Administrators. (3) Pre- or Corequisite(s): STAT 1222 or its equivalent, and admission into MPAD Program. An introduction to the application of social science research methods to problems in public management and policy. Topics include: research design, measurement, data collection techniques, sampling, and decision-making theory. Includes basic introduction to the manipulation of data sets with statistical software.

MPAD 6126. Data Analysis for Decision Making. (3) Prerequisite(s): STAT 1222 or its equivalent and MPAD 6125; and admission into MPAD Program. Continuation of MPAD 6125 by developing proficiency with an array of statistical procedures and tools for choosing which procedure applies to various decision making situations. Focus is on problem setup, computer-based computations, and outcome interpretation in applied settings.

MPAD 6128. Foundations of Public Policy. (3) An examination of the role of public administrators in the policy process. Topics focus on issue formation, agenda setting, decision making, implementation, and policy evaluation. Course emphasizes the role of political actors and institutional constraints in various policy arenas.

MPAD 6131. Public Budgeting and Finance. (3) Pre- or Corequisite(s): Admission into MPAD Program. An introduction to the basics of public finance and an examination of the theory and development of public budgeting, the budget processes, the budget cycle, budget reforms, capital budgets, revenue sources, taxation policies and processes, intergovernmental fiscal relations and governmental accounting practices, debt management and cash management in public organizations.

MPAD 6134. Human Resources Management. (3) Pre- or Corequisite(s): Admission into MPAD Program. Study of the context of public personnel administration; basic functions of job evaluation and compensation, employee rights and responsibilities; the legal constraints including equal opportunity, health and safety, collective bargaining; government productivity.

MPAD 6142. Grant Writing and Reporting. (3) Focuses on the life cycle of grants and the researching, writing, managing, and reporting skills necessary to manage grants in public and nonprofit organizations.

MPAD 6143. Introduction to Administrative Law. (3) Prerequisite(s): MPAD 6102 or permission of instructor. Examines the legal principles governing the modern administrative state, including: the Constitutional status of administrative agencies; legislative, judicial, and executive control of administrative agencies; discretion in making, adjudicating, and enforcing law and policy; the Administrative Procedures Act; and judicial review of agency action.

MPAD 6160. Leadership in the Digital Era. (3) Public and nonprofit organizations are increasingly dependent on information technology in the delivery of services. This course examines the organizational challenges and best practices associated with successful information technology outcomes. Specifically, it focuses on the implementation of IT on organizational performance. It exposes the student to many of the challenges of leading organizations in a digital environment.

MPAD 6174. Public Policy and Politics in Healthcare Administration. (3) Cross-listed Course(s): HADM 6142. Prerequisite(s): HADM 6100. Examination of the formulation, adoption and implementation of public policy for healthcare through federal, state and local political processes.

MPAD 6184. Urban Government and Politics. (3) Introduces students to urban affairs: the development of urban areas, the structures of local governmental bodies, the actors common to urban political scenes, and the incentives that motivate citizens and city officials. Illustrates urban policy issues such as poverty, race, transportation, housing, public safety, education, economic development, land-use, and service delivery.

MPAD 6185. Intergovernmental Relations. (3) Survey of the complex relationships of governments in an urban environment set in the federal system. A review of the problems created by that system and the approaches to their solutions.

MPAD 6187. Advanced Seminar in Public Management Problem Solving. (3) Prerequisite(s): All core courses in the

MPAD Program and approval by the Program Director. Seminar viewed as a capstone to the student's coursework in public management and is required to be taken by all students. Seminar devoted to topics in public management, which involve problem identification and solution.

MPAD 6188. Research Applications in Public Administration. (3) Prerequisite(s): All core courses in the MPAD Program and approval by the Program Director. Preparation of a major paper on a topic of significance in public or nonprofit administration. Topics must be approved by the instructor, and paper drafts will be revised by the student following evaluation by the instructor. Each paper must be well grounded in the appropriate professional literature and must demonstrate competence in professional communication skills.

MPAD 6210. Aging and Public Policy. (3) Cross-listed Course(s): GRNT 6210. Examination of the public policy making process with attention to aging policy. Consideration of determinants of aging policy and institutions and actors in the policy making process and piecemeal development of legislation will be analyzed as factors related to the making of policy for the aged.

MPAD 6211. Administration of Aging Programs. (3) Cross-listed Course(s): GRNT 6211. Focuses on the implementation of public policies and programs for the aged and the development and administration of these programs. Students become familiar with the process through which policies are transformed into aging programs and the budgetary, management and evaluative considerations that must be considered.

MPAD 6290. Emergency Management. (3) Focuses on the principles and practices of emergency management at the local, state, and national levels and will explore the concepts of preparedness, mitigation, response and recovery. Conducted from the perspective of emergency management's impact on local government and infrastructure, and the community's ability to prepare for, respond to, and recover from a wide array of catastrophes.

MPAD 6291. Homeland Security and Terrorism. (3) Investigates the organization and operation of the Department of Homeland Security, with a special emphasis placed on how the department deals with the threat of terrorism. Strategies and tactics for fighting terrorism as well as other threats to homeland security will be examined.

MPAD 6292. Disaster Management. (3) Emergency managers must be prepared to face a wide variety of natural, technological and public health disasters in their communities. Having a good understanding of a potential

disaster's unique characteristics and dynamics can help an emergency manager better prepare for the worst-case scenario. Focuses on a series of natural and weather-related disasters, technological or man-made disasters and public health disasters.

MPAD 6310. Foundation of the Nonprofit Sector. (3)

Survey of the history, culture and legal foundation of the nonprofit sector. Key definitions, scope and relationships between the nonprofit, for profit and government sectors are discussed. Examines current policy issues confronting nonprofits.

MPAD 6311. Introduction to Nonprofit Management. (3)

Examination of the structure, function and administration of nonprofit organizations. Developing strategies to ensure financial and ethical management.

MPAD 6312. Fundraising. (3) Provides a comprehensive overview of fundraising techniques geared toward various types of nonprofit organizations including education, health, arts and social services. Topics include: Annual giving, major gifts, estate planning, working with corporations and foundations, ethics and legal responsibilities. Students learn to balance organizational needs with donor interests and the vehicles that can accomplish those goals.

MPAD 6314. Marketing for Arts and Nonprofit

Organizations. (3) Recognizing the breadth and complexity of cultural organizations, the purpose of this class is to familiarize students with the fundamentals of marketing organizational programs and activities within the visual art field. Students will be given a broad overview of the functional components of administrative management and participation in the theory and techniques of public relations, audience development, market research, advertising and various promotional strategies. They will have the opportunity to explore, discuss and understand the principles of successful marketing for art organizations.

MPAD 6316. Introduction to Arts Administration. (3)

Prerequisite(s): MPAD 6311. Introduction to the history and practice of arts administration. Explores the distinctions and challenges common to all areas of the arts and considers the differences in mission and administration among organizations in theatre, dance, music, visual arts, media arts, arts councils and arts service organizations, arts education, and multidisciplinary organizations. Examines regulations and distinctions related to nonprofit status and various new hybrids. Reviews community involvement in the arts at the local, state, regional, and national levels. Shares the cultural and economic contributions of the arts.

MPAD 6318. Arts Administration II. (3) Prerequisite(s):

MPAD 6316. Examines the manner in which artists and arts organizations build community and function within and

support their communities. Topics include: cultural planning, public art and place-making, public policy, the integration of multiple cultures into arts policy and programs, understanding cultural democracy, and using the arts in the development of community identity.

MPAD 6324. Financial Analysis for Nonprofit

Organizations. (3) Topics include: fund accounting basics for nonprofit organizations, preparation and analysis of financial statements, evaluating and monitoring financial condition, capital budgeting and investment analysis, debt policy and management.

MPAD 6326. Applied Economics for Public Administrators. (3)

Introduces students to the fundamental concepts of microeconomics in order to enhance their analytical skills to a level that is appropriate for practitioners in the public sector. Focuses on how the market works, why the market results in beneficial exchanges between sellers and buyers, what effects government intervention can have upon the market, whether government intervention is necessary, and how the tools of economics can be used by public administrators to improve decision making.

MPAD 6327. Internal Capacity Building in Nonprofit

Organizations. (3) Development of proficiency among an array of internal management tools, including: strategic planning; volunteer recruitment, management, and retention; and program evaluation and performance measurement.

MPAD 6328. Urban and Community Development. (3)

Examines the policies and programs designed to reduce social and economic distress in U.S. communities and focuses on local and neighborhood-based efforts to address problems of inadequate housing, unemployment, lack of community services and facilities, crime etc. Considers the various roles that government, private sector, and nonprofit organizations play in community revitalization.

MPAD 6330. Program Evaluation for the Public and

Nonprofit Sectors. (3) Designed to give students a comprehensive overview of the theory, concepts, methods, and tools of program evaluation. In addition to providing an overview of various types and uses of program evaluation, the course emphasizes building expertise in evaluation design, developing process and outcome measures, analyzing data, and reporting results. Addresses the use of evaluation tools to support the development and management of programs.

MPAD 6332. Project Management. (3)

A project is a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project's objectives have been

achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists. This course explores the discipline of project management across the project lifecycle. Based on the Project Management Institute's (PMI) *Project Management Body of Knowledge*. At the completion of the course, students should have the knowledge to successfully complete the PMI's certification exam.

MPAD 6350. Public Sector Financial Management. (3)

Prerequisite(s): MPAD 6131. Takes students beyond the introductory material in MPAD 6131 into a more thoroughgoing analysis of the finance function in modern governments. The dimensions of budgeting and financial management theory and practice which are examined include: public sector managerial accounting for revenues and expenditures; basic governmental accounting principles and procedures; the relationship of budgets to the accounting system; principles and concepts of revenue policy and administration. Topics covered are some of the fundamental aspects of public financial management.

MPAD 6352. Public Sector Financial Reporting and Analysis. (3)

Prerequisite(s): MPAD 6131. Extending the coverage of public financial management topics to include the accounting and reporting activities of government and nonprofit organizations. The dimensions of accounting and financial management theory and practice which are examined include: accounting for revenues and expenditures; basic governmental accounting principles and procedures, business-type activities of governments, governmental third-party fiduciary activities, agency relationships, the relationship of budgets to the accounting system, financial reporting and auditing, financial statement analysis, and credit analysis. A unit of the course also concerns ethics, risk-taking and accountability, with a special emphasis on high-risk "derivative securities," and the need to maintain the highest standards of fiduciary responsibility.

MPAD 6800. Directed Study in Public Administration. (3)

Prerequisite(s): All core courses in the MPAD Program and approval by the Program Director. Individual project proposal on a directed topic of significance based on field experience in public administration. *Graded on a Pass/In Progress basis.*

MPAD 6801. Directed Study in Public Administration. (3)

Prerequisite(s): MPAD 6800 and approval by the MPAD Program Director. Individual project report on a directed topic of significance based on field experience in public administration. *Graded on a Pass/In Progress basis.*

MPAD 6820. Independent Study. (1 to 3)

Prerequisite(s): Permission of instructor and the MPAD Program Director. Supervised study of a public administration topic or

problem of special interest to the student, within the instructor's expertise, and normally an extension of previous coursework with the instructor. *May be repeated for credit with change of topic.*

Management (MSMG)

MSMG 6100. Quantitative Business Analysis. (3)

An introduction to the analytical foundations of business decision making. Students learn to identify important issues to be considered when working with data to answer a question. They also learn the basics of analyzing data and making decisions based on the analysis. Topics include: basic statistics through regression analysis.

MSMG 6110. Principles of Financial and Managerial Accounting. (3)

Accounting is the language of business. This course teaches students how to interpret financial statements to evaluate the performance and strength of a business. Students also learn how organizations determine the cost of providing goods and services; use accounting data for budgeting and profit planning; and identify strategies for improving the quality of goods and services for customers while increasing efficiency, profitability, and sustainability of the organization.

MSMG 6120. Management and Organizational Behavior. (3)

An examination of individual, group, and organizational issues that affect and shape organizations. Topics include: individual differences, motivation, communication, decision-making, leadership, power, organizational structure and design, and change.

MSMG 6130. Economics for Managers. (3)

Economics for managers covers the micro- and macroeconomic concepts required to understand the environment in which business firms operate. Topics include: supply and demand, the behavior of firms and consumers, business cycles, exchange rates, and the effects of monetary and fiscal policies.

MSMG 6140. Information Systems Management. (3)

Information Systems are an essential tool for conducting business and gaining a competitive edge in an increasingly global economy. This course educates future managers on conceptual foundations underlying the management of information resources. Students are also exposed to widely used business applications software.

MSMG 6150. Managing Talent for Strategic Advantage. (3)

Human resource management plays an important role in creating and sustaining competitive advantage. This course

focuses on the manager's role in attracting, developing, and retaining talent in organizations. Contemporary issues such as globalization, outsourcing, workforce diversity, mergers and acquisitions, downsizing, and occupational health, safety, and security are explored in terms of their strategic value.

MSMG 6160. Marketing from a Management Perspective.

(3) Since all companies (i.e., both for-profit and non-profit) require some form of selling to be in business, it is incumbent upon managers to have an understanding of marketing processes. This course educates future managers on the psychology and sociology associated with consumer behaviors. Upon completion, students will have the skills needed to make informed and critical decisions required for the company's future profitability.

MSMG 6170. Analysis for Financial Management.

(3) The theory and practice of financial management, including financial instruments and markets, financial statement analysis, financial forecasting, cost of capital and capital budgeting, and evaluating investment opportunities. Students learn the methods and techniques for assessing the financial health of a company, planning future financial performance, and creating value for shareholders.

MSMG 6180. Managing Your Organization's Operations.

(3) The operations function is an integral part of every organization, and managers must be familiar with issues arising in this area. This course educates future managers on understanding how to manage the provision of goods and services both effectively and efficiently, as well as understanding how to improve related processes.

MSMG 6190. Managerial Ethics and Leadership. (3) An examination of the role and impact of management decisions on employees, customers, investors, and the environment. This capstone course focuses on management and decision-making to facilitate ethical and sustainable organizations.

MSMG 6690. Career/Professional Development Seminar.

(0) Prerequisite(s): Permission of Graduate Program Director. Coverage of various career development topics and activities, including self-assessment, personal branding, resume writing, interview skills, leadership and networking, community and corporate speakers and site visits.

Real Estate (MSRE)

MSRE 5131. Fundamentals of Financial Accounting and Financial Management. (3) Cross-listed Course(s): MBAD 5131. Accelerated and in-depth study of conceptual foundations and applications of financial accounting and financial management with emphasis placed on building

accounting and finance information bases for external decision making.

MSRE 6100. Real Estate Seminar Fall. (1) Prerequisite(s): M.S.

Real Estate students only. Designed to provide students with exposure to emerging trends in the real estate industry. Students are required to participate in real estate trade organization meetings, engage in leadership and negotiation training, attend guest lecturers covering real estate trends and ethical business practices, and complete professional development seminars.

MSRE 6101. Real Estate Seminar - Spring. (1) Prerequisite(s):

M.S. Real Estate students only. Designed to provide students with exposure to emerging trends in the real estate industry. Students are required to participate in real estate trade organization meetings, engage in leadership and negotiation training, attend guest lecturers covering real estate trends and ethical business practices, and complete professional development seminars.

MSRE 6102. International Real Estate Study Tour. (3)

Students travel to an international city to study real estate development. Opportunities and challenges in the regional real estate market will be explored through the completion of a series of study tours, presentations, reading assignments and short essays. Emphasis will be placed on issues such as urban planning, sustainable growth, economic development and global market integration.

MSRE 6120. Real Estate Law. (1.5) Prerequisite(s): MSRE 5131.

Provides an overview of common legal issues involved in the acquisition, development, financing, ownership and operation of real estate assets. Emphasis is placed on legal forms of ownership, real estate sale and lease transactions, and government regulation and taxation of land.

MSRE 6130. Site Planning. (1.5) Introduces essential

principles of site planning, design and construction. Special emphasis is placed on programming and sustainability issues for different project types. The nature and characteristics of construction materials, equipment, and systems used in modern buildings are presented and how they affect function and feasibility.

MSRE 6152. Financial Management. (3) Cross-listed

Course(s): MBAD 6152 and FINN 6152. Prerequisite(s): MSRE 5131. Theory and practice of corporate finance including asset management, cost of capital and capital budgeting, optimization programs and socio-economic aspects of financial management. Computer technology may be employed when applicable.

MSRE 6158. Real Estate Finance and Investment. (3) Cross-

listed Course(s): MBAD 6158. Prerequisite(s): MSRE 5131. Focuses on the techniques used to analyze, finance and structure real estate transactions. Topics include: an

overview of the real estate space and capital markets; the techniques of financial analysis and valuation; project ownership structures, taxation and financial structure; real estate in an investment portfolio; and determining the financial feasibility of real estate development.

MSRE 6159. Real Estate Development. (3) Cross-listed Course(s): MBAD 6159. Prerequisite(s): M.S. Real Estate Students and MBA Real Estate Concentration Students. Pre- or Corequisite(s): MSRE 6245 and MSRE 6220. An introduction to the real estate development process. Identification and evaluation of the critical assumptions and issues related to market and site feasibility, financial feasibility, planning, acquisition, and operation of economically viable commercial real estate projects. Students work in groups on a semester project to select a site and prepare an appropriate development plan that emphasizes the market and financial feasibility of the real estate development.

MSRE 6160. Real Estate Capital Markets. (3) Cross-listed Course(s): MBAD 6160. Prerequisite(s): MSRE 6152. The techniques used to analyze, finance and structure real estate transactions, and emphasizes the role of the capital markets in facilitating development and investment in commercial real estate. Topics include: real estate in an investment portfolio; valuation and investment analysis for direct (private) real estate equity investment including coverage of valuation using real option methodology; primary and secondary commercial mortgage markets (CMBS); and, analysis of publicly traded equity real estate investment trusts (REITs).

MSRE 6210. Student Managed Real Estate Investment Fund I. (3) Prerequisite(s): MSRE 6220 and MSRE 62245 M.S.; Real Estate students or advisor approval. Focuses on managing an actual real estate portfolio consisting of a portion of the University's Endowment Fund.

MSRE 6211. Student Managed Real Estate Investment Fund II. (3) Prerequisite(s): MSRE 6210; M.S. Real Estate student or Advisor Approval. Focuses on managing an actual real estate portfolio consisting of a portion of the University's Endowment Fund.

MSRE 6220. Financial Analysis of Real Estate Investments. (1.5) Prerequisite(s): MSRE 6158, MSRE 6159, or permission of instructor. Provides students with the analytical and computer skills necessary to evaluate the financial feasibility of real estate investment opportunities, including acquisition and development opportunities for land, commercial, industrial, or multi-family deals. Accounting and taxation issues influencing the financial viability of real estate investment opportunities are also considered.

MSRE 6230. Construction Management. (1.5) Addresses the various roles and responsibilities of the contractor and

construction manager in the development process including discussion of the owner/designer/constructor relationship. Emphasis is placed on sustainable design and other public policy objectives advanced by specific types of development, as well as the role the public sector may play in the success of real estate projects.

MSRE 6238. Real Estate and Urban Economics. (3) Prerequisite(s): ECON 2102. Cross-listed Course(s): ECON 6238 and MBAD 6238. Focuses on the fundamental economic forces that create urban areas, with a special emphasis on land markets. Integrates economic theory to better understand the market forces that impact applied real estate development projects. Topics include: urban growth and development; land valuation; the modelling and estimation of agglomeration economies; the costs of cities and their internal structure with emphasis on land use regulations and transportation; amenities and the local supply of labor; the sizes and functions of cities; affordable housing; and local public finance.

MSRE 6240. Real Estate Valuation Methods. (3) Prerequisite(s): MSRE 6220 and MSRE 6245; M.S. Real Estate students and Real Estate and Development Graduate Certificate students. Introduction to modern approaches to both land and building valuation, with extensive treatment of the highest and best use concept and applications of discounted cash flow, income capitalization, and residual techniques. Emphasizes investment and lease valuation models and looks at their role in providing essential income and cash flow measurements.

MSRE 6241. Advanced Topics in Real Estate. (3) Special varying topics that allow students to focus on any functional area of real estate.

MSRE 6242. Asset Management. (3) Prerequisite(s): MSRE 6220 and MSRE 6245; M.S. Real Estate students and Real Estate and Development Graduate Certificate students. Introduction course to asset management that focuses on how to increase value through management of operations, as well as the asset itself. Provides an understanding of lease analysis, maintenance and construction, reporting and insurance, property valuation, and measuring performance and providing recommendations.

MSRE 6245. Real Estate Market Analysis. (1 to 5) Prerequisite(s): M.S. Real Estate, Graduate Certificate Real Estate and Development. Application of analytical process for evaluating the market potential of both developed and undeveloped real estate. Provides a broadened historic perspective on modern city and understanding of how to apply analytical framework to real estate market analysis. Focuses on the process and documents associated with acquiring and disposing of commercial real estate areas.

MSRE 6258. Site Feasibility Analysis. (3) Cross-listed Course(s): GEOG 6305 and MBAD 6258. Prerequisite(s): MSRE 5131. Examination of factors affecting the feasibility of land parcels for commercial and residential development with emphasis on the physical evaluation of a given site, the market support for its intended use, and the financial support for the proposed development.

MSRE 6259. Applied Real Estate Development. (3) Cross-listed Course(s): MBAD 6259. Prerequisite(s): MSRE 6159 or MBAD 6159. The application of the processes involved in real estate development. Students work in groups on a semester project to select a site and prepare an appropriate development plan that emphasizes the market and financial feasibility of the real estate development.

MSRE 6310. Land Use Policy. (1.5) Provides a better understanding of the legal and administrative framework used to regulate land use. Students learn about zoning laws and procedures, takings, regulatory takings, and eminent domain legal constraints impacting real estate development.

MSRE 6999. Real Estate Capstone. (3) Prerequisite(s): MSRE 6220 and MSRE 6245; M.S. Real Estate students. Designed to bring together the topics covered in the MSRE program and examine how they relate to each other. Students complete applied group projects, as well as conduct independent research, to explore issues of interest to the real estate industry. All of these projects encourage students to develop their leadership and negotiation skills, as well as consider ethical issues commonly faced by real estate professionals.

Urban Design (MUDD)

MUDD 5101. Design Basics. (3) Prerequisite(s): B.A., B.S. or equivalent college degree. This introductory graduate course in architecture is intended for students newly admitted to the School of Architecture's 3+ year professional program. An introductory, intensive studio-based course that includes an introduction to freehand drawing, 2-D composition, 3-D modeling, and visual theory to prepare students without design backgrounds to begin design degrees. Students are introduced to a variety of related topics that serve as critical departure points for understanding and making architectural and urban projects.

MUDD 5601. Community Planning Workshop. (3) Cross-listed Course(s): ARCH 6050 and GEOG 6501. Serves to acquaint students with contemporary theory and practice in planning and urban design; to give students experience in applying planning and urban design theory and methods

to actual problems; to provide students with experience in compiling and analyzing community scale data, working with citizens, professional planners and designers, and elected officials, to provide students with experience in the preparation of oral reports and technical documents; and to examine what it means for the planner and urban designer to demonstrate ethical responsibility to the public interest, to clients and employers, and to colleagues and oneself.

MUDD 5602. Planning, Law, and Urban Design. (3) Examines the impact of planning law on the urban form of cities, both historically and in terms of contemporary professional practice. It surveys the impacts of planning regulations from Philip of Spain's "Laws of the Indies" at the beginning of American colonization through the development of English common law property rights, their extension to America and the development of zoning and planning legislation during the 20th century. Special attention is paid to current applications of form-based zoning codes in Britain and America and their implications for urban design and the patterns of settlement.

MUDD 6050. Urban Design Elective. (3) Study of topical areas of urbanism and urban design. May include courses from the M.A. in Geography (Community Planning Track) program and/or Master of Science in Real Estate (MSRE) program by permission of the Director of the M.U.D Program. *May be repeated for credit with change of topic.*

MUDD 6100. Directed Independent Study. (1 to 3) Prerequisite(s): Permission of the M.U.D Program Director and the graduate faculty member advising the study. Directed individual study and in-depth analysis of a special area related to the interests of the student and the expertise of the advising faculty member. May generally be taken once for credit towards degree.

MUDD 6101. Urban Design Studio I. (6) Explores and tests issues focused around the making of sustainable public infrastructure, spatial definition by buildings, and the particular dynamics of civic and social spaces. Coursework focuses on fundamental concepts as well as the acquisition and practice of a wide range of technical and graphic skills and media.

MUDD 6102. Urban Design Studio II. (6) Prerequisite(s): MUDD 6101. This intermediate design studio focuses on the sustainable development of neighborhoods, districts, sites and urban open spaces, exploring design process issues as well as the continued acquisition and practice of a variety of technical and graphic skills. *(Spring)*

MUDD 6205. Modern City: Theories and Forms. (3) Cross-listed Course(s): ARCH 4205, ARCH 5204, and ARCH 6050. An historical survey of urban design from the mid-

19th century to the end of the 20th century, focusing on various ideas of urbanism and their impact on the contemporary practice of urban design and development. It investigates the cities and large-scale urban projects resulting from revolutionary ideas of urban design and important theories of urbanism. The course is organized with topical discussions on the emergence of modern city planning, monumental city, garden city, suburbanization, new urbanism, ecological urbanism, and global city among other paradigms of modern city.

MUDD 6606. GIS and Urban Mapping. (3) An applied research course focused on the broader technical issues of what a contemporary geographic information system (GIS) is and how the system can help us model and better understand the dynamic complexities of a city. Introduces students to a mix of geographic information system theory and applications to urban design and planning problems. Topics include: geographic projection and coordinate systems, data management, models of spatial data, spatial analysis techniques, and GIS implementation issues.

MUDD 7102. Urban Design Studio III. (3 or 6)
Prerequisite(s): MUDD 6102. This final studio is the capstone of the Urban Design Program. It focuses on site-specific projects and emphasizes methods of research and design, as well as technological and systemic issues of sustainability in urban environments. It pursues a directed research and design agenda that varies according to faculty interest, expertise, and/or project requirements.

MUDD 7103. Urban Design Studio IV. (3) Prerequisite(s): MUDD 6102. Part two of an advanced, two-part design studio focuses on site-specific projects in countries outside the USA and emphasizes methods of research and design as well as technological and systemic issues of sustainability in dense and vertical urban environments. Part II is held in Charlotte and completes the design projects commenced abroad. Pursues a directed research and design agenda that varies according to faculty interest, expertise and/or project requirements. May build upon the resources of the City.Building.Lab (CBL) at the School of Architecture.

MUDD 7120. Graduate Summer International Study. (3 to 6) Prerequisite(s): Approval of the M.U.D Program Director. The premise of this course is to allow graduate students to engage a summer experience abroad to support their growing knowledge of architecture and architectural discourse. This experience is intended to inform and motivate possible interests that the students might pursue in further study.

Music Performance (MUPF)

MUPF 6253. Applied Music: Voice. (2) Prerequisite(s): Admission to the Graduate Certificate in Vocal Pedagogy program. Corequisite(s): MUPF 6253L and approved principle ensemble. Consists of private instruction, a one-hour lesson per week leading to a formal jury at the end of the semester. *May be repeated for credit.*

MUPF 6253L. Voice Masterclass. (0) Corequisite(s): MUPF 6253. Weekly masterclasses for MUPF 6253. *May be repeated.*

Music (MUSC)

MUSC 5001. Topics in Music. (1 to 6) Prerequisite(s): Admission to MAT or MME and permission of the instructor. Special topics in music; *May be repeated for credit.* Specific topics courses will be field-tested and modified to become permanent courses.

MUSC 5137. Graduate Vocal Pedagogy I. (3) Prerequisite(s): Admission to the Graduate Certificate in Vocal Pedagogy program. Surveys the history of vocal pedagogy from Manuel García to present-day pedagogues, as well as investigates areas of interest such as singing psychology, repertoire selection, methodology development, and complementary training.

MUSC 5153. Graduate Vocal Pedagogy II. (3)
Prerequisite(s): MUSC 5137. Researches vocal mediation and remediation by examining pathologies, predisposing conditions, age-specific needs, health and care protocols, and ethics.

MUSC 6453. Voice Teaching Internship. (2) Prerequisite(s): Admission to the Graduate Certificate in Vocal Pedagogy program. Applied teaching with a select number of students, both male and female, and a weekly seminar to review and discuss issues and solutions in the studio and in another vocal-teaching contexts (e.g., choral, opera, ensemble, etc.), as appropriate. Students develop and document a systematic teaching methodology, learn how to select appropriate repertoire based on singer ability, and apply appropriate protocols for technical issues. *May be repeated for credit.*

MUSC 6600. Concluding Seminar. (3) Prerequisite(s): Admission to the Graduate Certificate in Vocal Pedagogy program. Concluding Seminar consists of a Directed Learning Project, enabling the student to focus on his or her area of pedagogical interest. Students are mentored through the project by a supervising instructor. Concluding Seminar is intended to provide a learning experience for

students to gain additional knowledge that reinforce their Vocal Pedagogy program and support student career goals.

Nanoscale Science (NANO)

NANO 8001. Perspectives at the Nanoscale. (2) NANO program faculty members present and discuss their research in nanoscale science to: (1) demonstrate how scientists from different disciplines approach problem-solving at the nanoscale, and (2) expose students to research opportunities for dissertation work. Students write summaries of the presentations.

NANO 8060. Special Topics in Nanoscale Science. (1 to 3) Prerequisite(s): Permission of instructor. Selected topics in nanoscale science. *May be repeated for credit.*

NANO 8101. Introduction to Instrumentation and Processing at the Nanoscale. (3) Cross-listed Course(s): OPTI 6301 and OPTI 8301. Methods of manipulating, engineering, and characterizing nanoscale materials are introduced; applications and principles of their operation are discussed. Students acquire hands-on experience with selected laboratory methods in preparation for dissertation research. Topics include, but are not limited to, scanning probe and electron microscopy methods, cleanroom technology, nanoscale optical and e-beam lithography, nuclear magnetic resonance, mass spectrometry, luminescence methods, interferometry, gel permeation chromatography, surface area analysis, and small-angle x-ray and neutron scattering.

NANO 8102. Nanoscale Phenomena. (3) Cross-listed Course(s): CHEM 6102, OPTI 6302, and OPTI 8302. Topics include: scaling phenomena; nano-optics (near-field optics, limits of lithography masks, nano-dots and nanoscale optical interactions); nanoscale mechanics; nanotribology; biological and biologically-inspired machines.

NANO 8103. Synthesis and Characterization of Nanomaterials. (3) Cross-listed Course(s): CHEM 6103. Prerequisite(s): NANO 8101 and NANO 8102, or permission of instructor. Topics include: quantum dots, metallic nanoparticles, carbon nanostructured materials and nanotubes, zeolites, organic-inorganic polymers, composite materials, solution-phase colloids, sol-gel process, silica spheres, porous silicon, photonic crystals.

NANO 8104. Fabrication of Nanomaterials. (3) Prerequisite(s): NANO 8101. Lithographic methods (CVD, PVD, e-beam, ion beam, magnetron, evaporation, spin coating, mask fabrication, developing resists); microelectromechanical systems and nanoelectromechanical systems; limits of conventional

mechanical processing, electroforming, growth mechanisms (organic, inorganic, thermal); powders.

NANO 8105. Life at the Nanoscale. (3) Prerequisite(s): Admission to the Ph.D. in Nanoscale Science program or permission of instructor. Discusses the four major biological molecules (nucleic acids, proteins, lipids, carbohydrates) with an emphasis on energetics, evolution, structure, and self-assembly. In addition, common methods for the analysis and preparation of biological materials are presented. Students are also introduced to specific topics such as cell signaling, antibody and nucleic acid aptamer development, viral and liposomal nanoparticles, as well as core concepts in molecular and synthetic biology.

NANO 8203. Collaborative Research Proposal. (3) Cross-listed Course(s): OPTI 6303 and OPTI 8303. Effective strategies for designing and writing research proposals are presented by program faculty members, and staff from proposal development offices on campus. Students work in teams of 2-3 to prepare an original, interdisciplinary research proposal on a topic in nanoscale science. The proposal conforms to regulations of a selected funding agency and must address a topic that is supported by that agency. Each team consults regularly with a panel of 2-3 faculty members who collectively approve the proposal topic, provide feedback during the development of the proposal, and ultimately evaluate the proposal. The course is designed to increase the ability of students to relate research ideas to fundamental concepts in science and engineering, to help students learn to develop effective methods of presenting ideas and defending them, to help students develop self confidence in their abilities to present and defend ideas, and to improve oral and written communication skills.

NANO 8301. Nanomedicine. (3) Prerequisite(s): Permission of instructor. The basic principles of the design, synthesis, and characterization of nanomaterials for medical applications. Topics include: general characteristics of nanoparticles; common biological barriers; factors affecting interactions between nanoparticles and biological systems; and recent advances in nanoparticle design within the context of biomedical applications. Specific applications such as cancer biology, immunotherapy, cancer diagnostics and therapeutics, and translating nanotechnology platforms into the clinic are also discussed.

NANO 8351. Nanoscale Materials for Energy Applications. (3) Prerequisite(s): Permission of instructor. Explores the role of nanoscale science and nanoscale materials in energy applications, including the areas of energy production (e.g., solar photovoltaics and thermoelectrics), energy storage (e.g., batteries, supercapacitors, solar fuels), and energy sustainability (e.g., carbon sequestration and gas storage).

Emerging topics in this rapidly evolving field are also addressed.

NANO 8352. Spectroscopy of Nanomaterials. (3)

Prerequisite(s): Permission of instructor. Explores three main areas: (1) fundamentals, including electronic structure theory of bulk solids and molecules, restriction of electronic wavefunctions in one or more dimension, and the theory of excitons in nanomaterials; (2) spectroscopy, including interactions of light with matter, spectroscopic probes of nanoscale electronic structure, and consequences of inhomogeneity; and (3) photoexcitation dynamics, including electron/energy transfer involving nanomaterials, unique phenomena, and future applications.

NANO 8353. Supramolecular Chemistry of Nanomaterials. (3)

Prerequisite(s): Permission of instructor. Explores the design, synthesis, and applications of supramolecular nanomaterials. Introduction to the background and development of the field, analytical methods, design of supramolecular building blocks, active areas of research, and applications of new materials. Topics include: the thermodynamics of molecular recognition, host-guest chemistry, self-assembly, mechanical bonding, solid-state supramolecular chemistry, and supramolecular polymerization.

NANO 8354. Solar Applications of Nanomaterials. (3)

Prerequisite(s): Permission of instructor. Addresses the rational design of devices and systems aimed at exploiting the advantages of nanomaterials for solar energy conversion, and covers the principles of light harvesting, charge separation, and free-charge carrier collection within the realm of recent advances in contemporary solar device engineering and architectures. Fundamental theories and concepts are discussed. Several hands-on laboratory opportunities are incorporated to enable students to learn about device structures and testing.

NANO 8400. Nanoscale Science Internship. (1 to 9)

Prerequisite(s): Completion of 18 credit hours of NANO courses or the equivalent; and permission of the Nanoscale Science Program Director. Full- or part-time internship in nanoscale science complementary to the major course of studies and designed to allow course-based practical learning to be applied in a supervised professional experience.

NANO 8681. Nanoscale Science Seminar. (1) Students learn about current research in the field of nanoscale science and related disciplines by attending weekly seminars of the Ph.D. in Nanoscale Science program. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

NANO 8682. Nanoscale Science Colloquium. (1) Students present seminars on current topics in nanoscale science,

including dissertation research, the scientific literature, and special topics. *May be repeated for credit.*

NANO 8900. Dissertation Research. (1 to 4) Research for the dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Nurse Anesthesia (NUAN)

NUAN 6151. Principles of Nurse Anesthesia I. (3)

Corequisite(s): NUAN 6156. Overview of the principles, techniques and equipment necessary for the administration of anesthesia for the general surgical client.

NUAN 6152. Principles of Nurse Anesthesia II. (3)

Prerequisite(s): NUAN 6151. Provides nurse anesthesia students with specific techniques of nurse anesthesia practice for selected clients.

NUAN 6153. Principles of Nurse Anesthesia III. (3)

Prerequisite(s): NUAN 6152. Advanced nurse anesthesia practice for selected patients. *(Summer)*

NUAN 6154. Advanced Pharmacology of Non-Anesthetic Agents. (4)

Prerequisite(s): NUAN 6156. An exploration of advanced pharmacological concepts and clinical application of non-anesthetic drugs and adjunct agents commonly used in the anesthetic arena.

NUAN 6155. Advanced Pharmacology in Anesthetic Agents. (4)

Corequisite(s): NUAN 6156. An exploration of advanced pharmacological concepts and clinical application of anesthetic drugs.

NUAN 6156. Applied Physics and Chemistry in Nurse Anesthesia. (3)

Prerequisite(s): Admission to the major. Basic laws and principles of physics, inorganic, organic, and biochemistry as they apply to the clinical practice of nurse anesthesia.

NUAN 6157. Advanced Applied Pathophysiology in Nurse Anesthesia I. (3)

Prerequisite(s): BIOL 6273. A study of advanced concepts of the pathophysiologies of the nervous, respiratory, cardiac, renal, and endocrine systems with emphasis on their anesthetic implications.

NUAN 6158. Advanced Applied Pathophysiology in Nurse Anesthesia II. (3)

Prerequisite(s): NUAN 6157. A study of advanced concepts of the pathophysiologies of the nervous, respiratory, cardiac, and hepatobiliary systems, emphasizing anesthetic implications and management.

NUAN 6171. Professional Aspects of Nurse Anesthesia I. (1)

Corequisite(s): NUAN 6153 and NUAN 6485. Overview of the professional aspects of nurse anesthesia practice

including history of the profession and professional associations, legal aspects, risk management, and the professional role.

NUAN 6172. Professional Aspects of Nurse Anesthesia II. (1)

Prerequisite(s): NUAN 6171. Corequisite(s): NUAN 6486.

Overview of the professional aspects of nurse anesthesia practice including economic considerations, political challenges, evolving role in the health care system, administrative responsibilities, practice regulations, and ethical principles.

NUAN 6485. Clinical Residency in Nurse Anesthesia I. (5)

Prerequisite(s): NUAN 6153 and satisfactory completion of Clinical Orientation. Clinical application of didactic material from the nurse anesthesia curriculum through beginning level practice in the role of a nurse anesthetist. Conferences during the clinical residency provide opportunities to review current research and practice issues. *Graded on a Pass/Unsatisfactory basis.*

NUAN 6486. Clinical Residency in Nurse Anesthesia II. (5)

Prerequisite(s): NUAN 6485. Continuation of the clinical application of didactic material from the nurse anesthesia curriculum with focus on utilization of additional anesthesia techniques and increased skills development. Conferences during the clinical residency provide opportunities to review current research and practice issues. *Graded on a Pass/Unsatisfactory basis.*

NUAN 6487. Clinical Residency in Nurse Anesthesia III. (5)

Prerequisite(s): NUAN 6486. Incorporation of the content of the nurse anesthesia curriculum with opportunities to begin synthesis of all didactic material and techniques for efficient clinical practice. Conferences during the clinical residency provide opportunities to review current research and practice issues. *Graded on a Pass/Unsatisfactory basis. (Summer)*

NUAN 6489. Clinical Residency in Nurse Anesthesia IV. (5)

Prerequisite(s): NUAN 6487. Final residency for synthesis of all didactic material and techniques of nurse anesthesia clinical practice, promotion of professional practice, and preparation of the student for national certification examination. Conferences during the clinical residency provide opportunities to review current research and practice issues. *Graded on a Pass/Unsatisfactory basis.*

NUAN 8154. Advanced Pharmacology of Non-Anesthetic Agents. (4)

Prerequisite(s): NUAN 8155 and Admission to the DNP in Nurse Anesthesia program. An exploration and analysis of the pharmacological concepts of non-anesthetic drugs and the clinical application of non-anesthetic drugs commonly used in the anesthetic arena for the surgical client. The course provides the pharmaceutical knowledge necessary to evaluate and pharmacologically manage the effect of non-anesthetic

drugs in the preoperative, intraoperative, and postoperative periods. This foundation of therapeutic decision-making in non-anesthetic drug selection for the surgical client based on health problems, individual variations, and current evidence-based principles are explored.

NUAN 8155. Advanced Pharmacology of Anesthetic Agents. (4)

Prerequisite(s): Admission to the DNP in Nurse Anesthesia program. An exploration and analysis of the pharmacological concepts of anesthetic drugs and the clinical application of anesthetic drugs. Covers the pharmaceutical knowledge necessary to evaluate and pharmacologically manage and interpret a client's anesthetic needs through a continuum of health and surgical requirements in a safe and effective manner. The foundations of therapeutic decision-making in drug selection for the client based on health problems, individual variations, and current evidence-based principles are provided.

NUAN 8156. Applied Physics and Chemistry in Nurse Anesthesia. (3)

Prerequisite(s): Admission to the DNP in Nurse Anesthesia program. The foundational knowledge of the basic laws and principles of physics, inorganic chemistry, and organic chemistry as they apply to clinical practice of nurse anesthesia. Students gain the necessary knowledge to apply the principles of chemistry and physics in the safe administration and evaluation of an individual anesthetic care plan for the general surgical client. This course also provides students with the foundational knowledge to manage and maintain a safe anesthesia workstation.

NUAN 8157. Advanced Pathophysiology in Nurse Anesthesia I. (3)

Prerequisite(s): NURS 6273 and Admission to the DNP in Nurse Anesthesia program. The foundational knowledge of the more common pathophysiologies of the nervous, respiratory, cardiac, liver, kidney and endocrine systems, with emphasize on their anesthetic implications. Students evaluate, interpret, and manage the surgical population's physiological response to anesthesia and to apply therapeutic decision-making in anesthetic related alterations in hemostasis.

NUAN 8158. Advanced Pathophysiology in Nurse Anesthesia II. (3)

Prerequisite(s): Admission to the DNP in Nurse Anesthesia program. Pre- or Corequisite(s): NUAN 8157. Builds on the foundational knowledge and offers advanced knowledge of the more common pathophysiologies of the nervous, respiratory, cardiac, and liver systems emphasizing anesthetic implications. Provides expanded knowledge on the ability to evaluate, interpret, and manage the complex surgical population's physiological response to anesthesia and to apply therapeutic decision-making in anesthetic related

alterations in hemostasis. An introduction to the basic genomics of anesthetic is also provided.

NUAN 8161. Principles of Nurse Anesthesia I. (3)

Prerequisite(s): Admission to the DNP in Nurse Anesthesia program. The foundational knowledge of anesthetic principles, techniques, and equipment that is necessary to administer and manage an individual anesthetic plan to the general surgical client. Provides the necessary knowledge to evaluate, interpret, and manage a general surgical client's hemodynamic and physiological response to anesthesia and to apply therapeutic decision-making in anesthetic related alterations in hemostasis. Offers an overview of the principles, techniques, and equipment necessary for the administration of anesthesia for the general surgical client.

NUAN 8162. Principles of Nurse Anesthesia II. (3)

Prerequisite(s): Admission to the DNP in Nurse Anesthesia program. Pre- or Corequisite(s): NUAN 6151. The foundational knowledge of anesthetic principles, specific techniques, and equipment that is necessary to manage and deliver the care needed to selected clients such as the uncomplicated and complicated obstetric and pediatric patient. Students evaluate, interpret, and manage the hemodynamic and physiological response to anesthesia and apply therapeutic decision-making in anesthetic related alterations in hemostasis for selected populations.

NUAN 8163. Principles of Nurse Anesthesia III. (3)

Prerequisite(s): NUAN 6151, NUAN 6152, and Admission to the DNP in Nurse Anesthesia program. Provides anesthesia students with advanced knowledge of anesthetic principles, techniques, and equipment that is necessary to manage and deliver the care needed to specific complicated patients. Students augment their knowledge and ability to evaluate, interpret, and manage the hemodynamic and physiological response to anesthesia and to apply therapeutic decision-making in anesthetic related alterations in hemostasis. The radiology component introduces the nurse anesthesia student to the fundamentals of radiology and outlines basic radiologic principles and radiation safety. Various radiologic techniques are identified, as well as interpretation of radiology examinations. Alternate radiographic techniques such as CT Scan, MRI, and ultrasound are discussed.

NUAN 8164. Principles of Nurse Anesthesia IV. (3)

Prerequisite(s): Admission to the DNP in Nurse Anesthesia program. Pre- or Corequisite(s): NUAN 8163. Provides anesthesia students with advanced knowledge of anesthetic principles, techniques, and equipment that is necessary to manage and deliver care to specific complicated patients. Students augment their knowledge and ability to evaluate, interpret, and manage the hemodynamic and physiological response to anesthesia and to apply therapeutic decision-making in anesthetic

related alterations in hemostasis for selected complicated populations. The regional anesthesia component introduces and builds on the foundational knowledge of regional anesthesia. neuraxial anesthesia, upper and lower peripheral blocks, and airway anesthesia. This course also educates advanced techniques of arterial and central venous access with the use of ultrasound technology.

NUAN 8171. Professional Aspects of Nurse Anesthesia. (3)

Prerequisite(s): NUAN 8488. Corequisite(s): NUAN 8489. An overview of the professional, ethical, and legal aspects of the practice of nurse anesthesia and the American Association of Nurse Anesthetists.

NUAN 8172. Nurse Anesthesia Review. (2) Prerequisite(s):

Admission to the DNP in Nurse Anesthesia program or permission of instructor. A thorough and in-depth review of major anesthesia concepts. Conceptual review includes chemistry and physics, physiology, pathophysiology, pharmacology, anesthesia related equipment, instruments, technology, basic and advanced principles of anesthesia, and professional aspects of anesthesia practice.

NUAN 8484. Clinical Residency in Nurse Anesthesia I. (1)

Prerequisite(s): NUAN 6152. Corequisite(s): NUAN 6153. An orientation to the clinical environment and the initial application of didactic material from the nurse anesthesia curriculum to care for the uncomplicated adult patient. 120 supervised clinical hours. *Graded on a Pass/Unsatisfactory basis.*

NUAN 8485. Clinical Residency in Nurse Anesthesia II. (2)

Prerequisite(s): NUAN 8163. Corequisite(s): NUAN 8164. The clinical application of didactic material from the nurse anesthesia curriculum through the beginning level practice in the role of a nurse anesthetist. Allows incorporation of the content of the nurse anesthesia curriculum with opportunities to apply didactic material and techniques for effective and efficient clinical practice. 240 supervised clinical hours. *Graded on a Pass/Unsatisfactory basis.*

NUAN 8486. Clinical Residency in Nurse Anesthesia III. (4)

Prerequisite(s): NUAN 8164. Pre- or Corequisite(s): NUAN 8485. The clinical application of didactic material from the nurse anesthesia curriculum through beginning levels of practice in the role of a nurse anesthetist. Conferences during the clinical residency provide opportunity to review current research and practice issues. 480 supervised clinical hours. *Graded on a Pass/Unsatisfactory basis.*

NUAN 8487. Clinical Residency in Nurse Anesthesia IV. (4)

Prerequisite(s): NUAN 8486. Continuation of the clinical application of didactic material from the nurse anesthesia curriculum with focus on utilization of additional anesthesia techniques and increased skill development in practice settings. 480 supervised clinical hours. *Graded on a Pass/Unsatisfactory basis.*

NUAN 8488. Clinical Residency in Nurse Anesthesia V. (4)
Prerequisite(s): NUAN 8487. Continuation of application of the nurse anesthesia curriculum with opportunities to synthesize didactic material and techniques for effective and efficient clinical practice. Conferences during the clinical residency provide opportunity to review current research and practice issues. 480 supervised clinical hours. *Graded on a Pass/Unsatisfactory basis.*

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NUAN 8489. Clinical Residency in Nurse Anesthesia VI. (4)
Prerequisite(s): NUAN 8488. Offers the final clinical residency for synthesis of all didactic material and techniques of nurse anesthesia clinical practice, promotion of professional practice, and preparation of the student for the national certification examination. Conferences during the clinical residency provide opportunity to review current research and practice issues. 480 supervised clinical hours. *Graded on a Pass/Unsatisfactory basis.*

Nursing Practice DNP (NUDN)

NUDN 8140. Foundations and Applications of Evidence-Based Practice. (3) An overview of models of Evidence-Based Practice, including theories and methods of translational research.

NUDN 8145. Leadership and Project Planning. (3)
Introduction to advanced leadership theories to facilitate management of clinical projects.

NUDN 8147. Applied Biostatistics. (3) Emphasizes statistical literacy and develops critical statistical thinking. Students analyze data sets and communicate statistical results in a concise, cohesive, and readable manner.

NUDN 8150. Principles of Quality Improvement for Patients, Systems, and Safety. (3) Prerequisite(s): Admission to the DNP program. Overview of the processes for quality improvement in health organizations and systems with emphasis on patient outcomes and safety.

NUDN 8160. Issues in Global Health. (3) An interdisciplinary perspective of contemporary issues, problems and controversies that affect social, economic, political, and environmental global health.

NUDN 8202. Community Epidemiology. (3) Principles and methods of epidemiology including definitions and models of health, illness and disease; modes of transmission of clinically important infectious agents; risk factors and chronic diseases; and insights into existing studies and paradigms of health promotion and disease prevention.

NUDN 8220. Healthcare Policy and Ethics. (3) Examines healthcare policy development strategies including the analysis of variables impacting policy implementation (e.g. politics and ethics).

NUDN 8230. Economic and Financial Aspects of Healthcare System. (3) Explores the study of financial and business factors related to health care delivery systems and advanced practice nursing.

NUDN 8260. Leadership and Healthcare Systems. (3)
Examines challenges and political issues impacting strategies for organizational design to promote communication, collaboration, conflict management, power sharing, and innovation.

NUDN 8270. Technology for Communication and Transforming Healthcare. (3) Provides opportunities to explore current theories/practices in information systems and health communication, and develop innovative strategies for using emerging information and communication technologies to facilitate patient care and inter-professional collaboration.

NUDN 8280. Leveraging the Clinical Practice Doctorate for Career Advancement. (3) Prerequisite(s): NUDN 8442 and enrollment in DNP program. Focuses on strategies to advance professional career of nurses earning practice doctorate. Emphasis on elevating career, expanding role, improving clinical practice by communicating benefits of practice doctorate, developing collaborative relationships, and disseminating scholarly work.

NUDN 8441. Clinical Residency and Project Development I. (2) The first of a four-course series that results in a scholarly DNP project. Students negotiate learning objectives with the course instructor for the practicum.

NUDN 8442. Clinical Residency and Project Development II. (2) The second of a four-course series that results in a scholarly DNP project. Builds on NUDN 8441 with a focus on project planning and translation of new knowledge into practice.

NUDN 8443. Clinical Residency and Project Development III. (3) The third of a four-course series that results in a scholarly DNP project. Builds upon knowledge gained in NUDN 8441 and NUDN 8442. Students implement the clinical project in the practice setting.

NUDN 8444. Clinical Residency and Project Development IV. (2) The last of a four-course series that results in a scholarly DNP project. Provides a culmination of NUDN 8441, NUDN 8442, and NUDN 8443. DNP students evaluate the outcomes and impact of the project and disseminates the findings.

NUDN 8641. Project Development I. (1) Pre- or Corequisite(s): NUDN 8140. The first in a four course series that corresponds with the DNP Scholarly Project. Examines identification and need for change in complex healthcare organizations, refining a problem statement, assessing need, and proposing a change in practice based on scientific evidence.

NUDN 8642. Project Development II. (2) Pre- or Corequisite(s): NUDN 8641. The second in a four course series that corresponds with the DNP Scholarly Project. Examines inter-professional, organizational, planning, and regulatory strategies in planning and executing evidence-based practice improvement projects in complex healthcare settings.

NUDN 8643. Project Development III. (1) Pre- or Corequisite(s): NUDN 8642. The third in a four course series that corresponds with the DNP Scholarly Project. Examines program implementation strategies, documentation of outcomes, and considerations for sustainability on changes in complex healthcare settings.

NUDN 8644. Project Development IV. (2) Pre- or Corequisite(s): NUDN 8643. The fourth in a four course series that corresponds with the DNP Scholarly Project. Examines termination of projects, assuring sustainability, and strategies for disseminating and reporting outcomes of practice-based projects.

NUDN 8999. DNP Clinical Elective. (1 to 4) Student initiate and conduct key components of an individual DNP clinical scholarly project or clinical hour contract with course implementation toward DNP Scholarly Project or required clinical hour completion. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

Nurse Practitioner (NUNP)

NUNP 6202. Complex Healthcare Management of Adults. (3) Prerequisite(s): NUNP 6250. Provides students with the opportunity to integrate knowledge from advanced assessment, pathophysiology, pharmacotherapeutics, theory and research to provide the advanced practice nurse with the requisite skills in the management of acutely ill adults in a variety of settings. Emphasis is placed on the use of diagnostic reasoning skills in the assessment, diagnosis, and plan of care, including pharmacological, and non-pharmacological management of acutely ill adults with urgent and emergent complex health issues. Application of models and theories to guide advanced nursing practice and planned evidence-based care of the adult with acute and/or chronic illness is expected in order to promote quality outcomes.

NUNP 6203 Advanced Care of Critically Ill Adults. (3) Prerequisite(s): NUNP 6202 and NUNP 6250. Provide students with the opportunity to integrate knowledge from advanced assessment, pathophysiology, pharmacotherapeutics, theory, and research to provide the advanced practice nurse with the requisite skills in the management of critically ill adults in a variety of environments. Emphasis is placed on the use of diagnostic reasoning skills in the assessment, diagnosis, and plan of care including pharmacological and non-pharmacological management of critically ill adults with life threatening, rapidly changing physiological, and pathophysiological conditions. Application of models and theories to guide advanced nursing practice and planned evidence-based care of adult with critical illness is expected in order to promote quality outcomes (240 supervised clinical hours).

NUNP 6240. Advanced Primary Care Reproductive Health. (3) Prerequisite(s): NURS 6220, NURS 6230, and NURS 6430. Pre- or Corequisite(s): NUNP 6250. Focuses on the role of the nurse practitioner in the primary care of family members in the reproductive stages. Uses a developmental approach to provide knowledge needed for advanced understanding and care of common health concerns related to the reproductive organs, including the genitourinary, and reproductive cycles of men and women. Concepts of health promotion, health maintenance and environmental variations are integrated throughout the course.

NUNP 6250. Advanced Primary Care and Health Promotion of Adults Across the Lifespan. (3) Prerequisite(s): NURS 6220, NURS 6230, and NURS 6430. Builds on knowledge of advanced assessment, pathophysiology, pharmacotherapeutics, and theory and research to provide the advanced practice nurse with the framework to manage adults with chronic illness in healthcare settings. Emphasis is placed on a wellness focus in the care of adults throughout the life span with common reoccurring acute illnesses and stable chronic conditions. Models of health promotion, disease prevention, health education and wellness will be used to guide the advanced practice nurse in assessing, diagnosing and planning care for adults. The case study approach is used as a framework to implement the diagnostic reasoning and clinical decision making process.

NUNP 6251. Advanced Acute and Preventive Care of Adults. (3) Prerequisite(s): Admission to the major. Builds on advanced assessment, pathophysiology, and pharmacology to provide the advanced practice nurse with the framework to manage adult preventive care for chronic illnesses in acute ambulatory settings. Emphasis is placed on preventive care in adults with common recurring acute and chronic conditions. Models of health promotion, disease prevention, and health education is used in assessing, diagnosing, and planning care.

NUNP 6260. Advanced Primary Care of Children and Adolescents. (3) Prerequisite(s): NURS 6220, NURS 6230, NURS 6430, NUNP 6250, and NUNP 6450. Corequisite(s): NUNP 6460. Focus is on the role of the family nurse practitioner in the primary care of families with children and adolescents. The course uses a developmental approach to providing knowledge needed for advanced clinical decision making related to children with common health problems including acute episodic illness and stable chronic disease. Concepts of health promotion and maintenance of environmental variables are integrated throughout.

NUNP 6400. Advanced Primary Care Across the Lifespan Practicum III. (4) Prerequisite(s): NUNP 6250 or NUNP 6251; Admission to the major. This clinical course requires 240 hours of supervised clinical time in a primary care setting and is the third of three required clinical practica. It is designed to provide the family nurse practitioner student the opportunity to manage acute, chronic, and preventive health care needs of patients and families across the lifespan. Includes seminar/case presentation and role development seminar. Individually arranged, hours and locations vary.

NUNP 6401. Advanced Care and Health Promotion Adults Practicum. (2) Pre- or Corequisite(s): NUNP 6250. Emphasis on the role of the advanced practice nurse in promoting healthy life-styles to prevent or minimize the effects of chronic illness. Students incorporate critical thinking and diagnostic reasoning in assessing, diagnosing, monitoring, coordinating, managing outcomes and communicating healthcare findings of adults and their families in individually arranged ambulatory care settings. 120 supervised clinical hours.

NUNP 6402. Advanced Practice Nursing in Complex Care Practicum. (4) Pre- or Corequisite(s): NUNP 6202. This clinical course focuses on treatment and outcome management of acutely ill clients with multi-system problems. Emphasis on the role of the advanced practice nurse in helping acutely ill adults manage the effects of urgent and emergent complex health issues and achieve quality outcomes in individually arranged ambulatory care settings. 240 supervised clinical hours.

NUNP 6403. Advanced Care of Critically Ill Adults Practicum. (4) Prerequisite(s): NUNP 6402. This clinical course focuses on the outcome management of critically ill adults with life threatening, rapidly changing physiological and pathophysiological conditions. Emphasis is on the role of the advanced practice nurse in developing, implementing and evaluating advanced care of critically ill adults. Clinical experiences are designed to provide opportunities in management and delivery of evidence-based care for the achievement of quality outcomes in a

variety of healthcare environments. 240 supervised clinical hours.

NUNP 6431. Advanced Acute Care Skills Lab. (1) Pre- or Corequisite(s): NURS 6230 and NURS 6430. Clinical practicum provides an opportunity for students to learn and practice commonly encountered advanced critical care skills required for performing assessments and technical procedures on acutely and critically ill adults. 60 lab/clinical hours.

NUNP 6440. Advanced Primary Care Across the Lifespan Practicum II. (4) Prerequisite(s): Admission to the major. Pre- or Corequisite(s): NUNP 6250 or NUNP 6251. This clinical course requires 240 hours of supervised clinical time in a primary care setting and is the second of three required clinical practica. It is designed to provide the family nurse practitioner student the opportunity to manage acute, chronic, and preventive health care needs of patients and families across the lifespan. Individually arranged, hours and locations vary.

NUNP 6450. Advanced Primary Care Across the Lifespan Practicum I. (2) Prerequisite(s): Admission to the major. Pre- or Corequisite(s): NUNP 6250 or NUNP 6251. This clinical course requires 120 hours of supervised clinical experience in a primary care setting. It is designed to introduce students to the management of acute, chronic, and health promotion/disease prevention needs of patients and families across the lifespan. It is the first of three required clinical practica. Individually arranged, hours and locations vary.

NUNP 6460. Advanced Primary Care of Children and Adolescents Practicum. (2) Prerequisite(s): NURS 6220, 6230, and 6430; NUNP 6250 and 6450. Corequisite(s): NUNP 6260. This clinical course is designed to provide family nurse practitioner students the opportunity to manage the healthcare of children and adolescents in primary care settings. Uses a developmental approach to guide management of the healthcare of children and adolescents from multiple backgrounds. The focus is on the synthesis of knowledge from the physical and psychosocial sciences to formulate advanced clinical decisions effective in the healthcare of children and adolescents and their families. 120 clinical hours. Individually arranged.

Nursing (NURS)

NURS 6090. Selected Topics in Nursing. (1 to 3) Prerequisite(s): Permission of instructor. Topics to be chosen from the specialties of nursing. *May be repeated for credit with change of topic.* No more than six hours of topics and/or independent study course credit in nursing may be applied toward degree requirements.

NURS 6101. Theoretical Basis for Nursing Practice. (3) Philosophical foundations and knowledge development in nursing. Evaluation of theories, models and their relationships to practice.

NURS 6115. Health Policy and Planning in the U.S. (3) Prerequisite(s): Graduate standing. Overview of the organization and financing of the healthcare delivery system in the United States. Analysis of healthcare policy, financing, political trends, ethical, and professional issues, including the theoretical underpinning of health policy making, the empirical thrusts of policy analysis and research, and the relationship between health policy making and political process in the practice of nursing and healthcare.

NURS 6160. Research in Nursing and Health Professions. (3) Methods of inquiry for research will be explored and critiqued nursing and the health professions. Emphasis is on translational research for evidence based developing skills useful for conducting and evaluating research, using research in practice and program evaluation.

NURS 6180. Community/Public Health Nursing Theory and Practice. (3) Examine how population-based theories and practice inform advanced practice and community/public nursing in communities and schools. Focuses on core public health functions and competencies, public health law and ethics, the role of C/PHN in influencing public health policies, Healthy People goals and objectives, and collaboration with communities to assess, plan, develop, implement, and evaluate health promotion programs.

NURS 6185. Theory and Application in the Organizational Behavior to Nursing Systems. (3) Prerequisite(s): NURS 6101 or permission of the instructor. Examination of organization theory, management theory and their applications to critical nursing administrative leadership issues. Standards and Frameworks of competencies in Nursing Administration are reviewed as guidelines for career development. Evidence-based management and promotion of a culture of safety is explored as a basis for health related organizational development.

NURS 6187. Financial, Human, and Information Technology Resource Management in Complex Systems. (3) Explores use of information systems for budgeting, finance, and decision-making for nurse leaders. Introduces information tools useful in analysis of decision-making and avoiding common decision errors that occur because of faulty ingrained beliefs and limitations of data. Emphasizes managerial aspects nurse leaders need in order to interact with the information technology applications utilized in financial and resource planning. Internal controls such as auditing concepts and techniques are introduced. Financial methods and informatics driven algorithms are presented

as decision models for creating a culture of safety. The managerial implications of cost analysis, capital investment decisions, equity and debt financing, and lease/purchase decisions are included.

NURS 6188. Application of Nursing Informatics in Strategic Planning and Decision-Making. (3) Explores theories of strategic planning for nursing and healthcare organizations with an emphasis on nursing informatics applications in practice such as telehealth and the electronic medical record. Identifying sources and information needed for identifying system vulnerabilities, strategic decision-making, and problem-solving techniques for analysis and forecasting are explored with attention to the organizational processes and context. Students learn to apply selected quantitative information management tools for planning services, implementing new technology, and evaluating strategic outcomes.

NURS 6189. Advanced Application of Telehealth and Virtual Care in Nursing. (3) Prerequisite(s): Admission to Nursing. Focuses on the application of telehealth, virtual care, and remote monitoring in nursing. The course offers an overview of virtual models of care including operational, legal, ethical, financial, and technology considerations in virtual nursing care programs.

NURS 6202. Applied Epidemiology in Advanced Nursing. (3) Prerequisite(s): Admission to Graduate Nursing program. Explores concepts and methods of epidemiology applied to population-focused healthcare in advanced nursing practice. Emphasis is placed on social determinants of health, measures of health, principles and ethics in screening, surveillance, methods of control and prevention, and the design, analysis, and interpretation of epidemiological studies. Students use epidemiologic reasoning in examining the etiology of health outcomes and in guiding the design of health programs.

NURS 6210. Family Health in Advanced Practice Nursing. (2) An overview of the family as the basic unit of advanced nursing care. Focuses on strategies of family assessment, family empowerment, and family health promotion. Includes reviews of relevant theories, concepts and research for the assessment and management of family health and the analysis of the socio-cultural context of families.

NURS 6211. Health Disparities and Nursing. (3) Examines various theoretical frameworks relative to interactions of individual background, environment, social stratification, and development of competence in Advanced Nursing Practice. It examines ethical, legal, regulatory standards that inform advanced practice and evaluates alternative strategies that nurses in advanced practice can use to provide interventions to multiple populations, patients, organizations, and communities.

NURS 6212. Program Improvement and Evaluation. (3) Focuses on planning, evaluating, and improving health programs. Includes steps in problem analysis and needs assessment, logistics of program management and implementation, evaluation, and quality improvement within systems and community oriented advanced nursing practice.

NURS 6220. Pharmacotherapeutics in Advanced Nursing Practice. (3) Principles of pharmacology and drug therapy for advanced nursing practice including legal and social considerations related to prescriptive authority and prescribing patterns. Satisfies NC Board of Nursing requirements for nurse practitioner.

NURS 6230. Advanced Health Assessment and Diagnostic Reasoning for Advanced Practice. (3) Pre- or Corequisite(s): BIOL 6273 or BIOL 6274. Corequisite(s): NURS 6430. Provides the knowledge and skills necessary for advanced practice nurses to synthesize concepts from nursing and the biopsychosocial sciences in the comprehensive health assessment of adults and children. The diagnostic reasoning process, differential diagnosis, advanced health evaluation techniques, laboratory tests, diagnostic studies and interpretation and evaluation of findings are incorporated into the course. Collaborative relationships between the nurse practitioner role and the nurse anesthetist role are developed through analysis of case studies.

NURS 6273. Advanced Human Physiology. (3) Prerequisite(s): Admission to the DNP in Nurse Anesthesia program. Advanced course in human physiology stressing the interaction between physiological systems.

NURS 6274. Advanced Human Pathophysiology. (3) Prerequisite(s): Admission to Advanced Clinical Nursing major. Explores advanced physiologic and pathologic mechanisms of disease as a basis for advanced practice nursing. It emphasizes the study of underlying changes in human physiology that is the result of disease or injury. A focus on body systems and common disorders is provided.

NURS 6275. Health Promotion, Nutrition, and Wellness for Older Adults. (3) Cross-listed Course(s): GRNT 6275. Prerequisite(s): Graduate standing or permission of the instructor. Explores self-care measures and health promotion practices with an emphasis on nutrition, that promote a healthy lifestyle. Topics include: principles of teaching and learning adapted to diverse older adults' needs and learning styles. Common barriers to healthcare and appropriate nutrition in older adults are also examined. Current findings from research will be integrated throughout the course. A foundational knowledge of human development is expected.

NURS 6282. Interprofessional Collaboration in Healthcare. (3) Cross-listed Course(s): SOWK 5104. Focus on interprofessional collaboration competencies to prepare health professionals for team-based care of patients, families, and communities. Emphasis on applying team values and ethics, roles and responsibilities, communication practices, and collaboration to improve health outcomes and promote physical, mental, and social well-being of diverse populations.

NURS 6301. Curriculum and Instruction in Nursing Education. (3) Theories and principles of adult learning. Curriculum/course planning, design, implementation, and evaluation. Creative teaching approaches and technologies. Evaluation of student learning, including test construction. Teaching/ learning/evaluation in the clinical setting.

NURS 6302. Trends and Issues in Nursing Education. (3) Examination of current trends and issues that nursing educators face: faculty roles and responsibilities, student roles and responsibilities, scholarship of teaching, leadership in nursing education, evaluation of teaching effectiveness, curriculum evaluation/accreditation, and legal and ethical issues.

NURS 6303. Instructional Technology in Nursing Education. (3) Introduction to instructional design using a variety of computer and technology-based media. The focus is on assisting students to gain skills in choosing appropriate instructional technologies in enhancing learning in both traditional and clinically-based educational settings.

NURS 6304. Teaching Practicum in Nursing Education. (3) Prerequisite(s): NURS 6301, NURS 6302, and NURS 6303. Guided experience with a master teacher in nursing for classroom and clinical teaching and evaluation, planned in the student's locale by student and faculty, plus online discussion forum. Design of a teaching portfolio. Design, implementation, and evaluation of course/class/clinical content. Includes 180 supervised clinical hours.

NURS 6305. Advanced Pathology and Pharmacology for Nurse Educators. (3) Prerequisite(s): Admission to Distance Education concentrations. Advanced knowledge of pathophysiology and pharmacology concepts for providing safe and effective nursing care. Focus on general pathophysiology principles that apply to individuals across the lifespan and the associated categories of pharmacological agents used in patient treatment. Does not fulfill requirements for students enrolled in APRN (nurse practitioner, nurse anesthesia) programs.

NURS 6306. Health Assessment for Nurse Educators. (3) Prerequisite(s): Admission to online programs. Advanced knowledge and skills for holistic health assessment of

individuals across the lifespan. Focus on assessment of all human systems, with an emphasis on advanced health assessment concepts, approaches, and techniques. Designed for graduate nursing students with direct care focus; does not fulfill requirements for students enrolled in APRN (nurse practitioner, nurse anesthesia) programs.

NURS 6430. Advanced Health Assessment and Diagnostic Reasoning Practicum. (1) Pre- or Corequisite(s): BIOL 6273 or BIOL 6274. Corequisite(s): NURS 6230. This clinical practicum is designed to provide an opportunity for students to practice advanced health assessment skills on clients across the lifespan. Comprehensive health histories and physical examination techniques are used to complete a database on clients to formulate differential diagnoses and make advanced clinical decisions. Includes 60 lab/clinical hours.

NURS 6480. Community/Public Health Nursing Internship I. (3) Pre- or Corequisite(s): NURS 6180 and NURS 6212. Internship I is the first of a two-semester clinical course for students in population or school nursing options. It is competency-based and is designed to reflect population-based advanced practice nursing in multiple settings. Students work under direct supervision of an assigned MSN-prepared preceptor to assess the need for a project and then to design an intervention. The internship builds on knowledge and skills from prior courses in the program. Placement with a preceptor is determined individually in consultation with the student. Includes 180 clinical hours.

NURS 6481. Community/Public Health Nursing Internship II. (3) Prerequisite(s): NURS 6480. Internship II is the second of a two-semester clinical course that builds on knowledge and skills from prior courses in Community/Public Health Nursing. It is competency-based and is designed to reflect population-based practice in multiple settings. Students work under direct supervision of an assigned MSN-prepared preceptor to assess the need for a project and then to design an intervention. Placement continues with the same preceptor from Internship I. Includes 180 clinical hours.

NURS 6485. Advanced Practicum in Nursing Administration and Leadership. (3) Prerequisite(s): NURS 6185. This practicum provides a guided administrative experience in a health related agency. Designed as a course where students synthesize nursing research, practice and theory in a project for improving the culture of safety under the supervision of a selected preceptor. Includes 180 clinical hours.

NURS 6495. Nurse Educator Advanced Clinical Practicum. (3) Prerequisite(s): Admission to MSN with Nurse Educator concentration. This practicum course emphasizes clinical nursing practice at an advanced level. Students participate in direct care experiences with a clinical nurse preceptor

to advance clinical nursing expertise within a chosen specialty area, expanding upon prior clinical knowledge. Emphasis is placed on the application of evidence-based, collaborative, interdisciplinary solutions to improve healthcare outcomes of individuals, families, and groups in a variety of settings. 180 supervised clinical hours.

NURS 6603. Synthesis in Advanced Nursing Practice. (3) Prerequisite(s): Admittance to MSN program. Students participate in a capstone experience in a selected topic area. The course prepares students to perform a rigorous critique of evidence derived from current research to generate evidence for clinical practice. It builds on existing theoretical and research foundations, and is taken in the last year of a student's program of study.

NURS 6895. Independent Study. (1 to 3) Guided individual study in topics or issues related to nursing arranged with a faculty advisor. *May be repeated for credit.* No more than six hours of topics and/or independent study courses may be counted toward degree requirements.

NURS 8201. Advanced Design and Theory in Nursing Research. (3) Prerequisite(s): Admission to the major. Quantitative and qualitative research approaches used to advance knowledge in nursing. The course examines various theories and assumptions of research design, measurement, and intervention development. Sampling diverse populations, rigor and research ethics are included.

NURS 8202. Transitioning from Practice to Nursing Science. (2) Prerequisite(s): Admission to the major. Discussion of transitioning from practice to science. Review of philosophy of science, scientific reasoning and the state of nursing science.

NURS 8203. Developing as a Nurse Scientist. (3) Prerequisite(s): Admission to the major. Introduction to the role and responsibilities related to being a nurse scientist. Includes a focused experience to gain research skills in data collection, analysis, interpretation, and reporting.

NURS 8204. Critical Topics in Nursing Research. (2) Prerequisite(s): Admission to the major. Critically examine current theoretical, methodological, and contextual issues in nursing research. Topics include representation of diverse populations and social determinants of health in research, ethics in inclusive research, the use of research in policy and advocacy.

NURS 8205. Grant Development and Management. (2) Prerequisite(s): Admission to the major. Emphasizes competence in the language of grants, proposal development, funding sources and processes, designing and writing proposal letters, creating budgets, developing effective evaluation tools, understanding fiscal management functions and regulations, and closing

research projects. Issues in conducting funded research in clinical agencies and multisite projects discussed.

NURS 8206. Leadership and Teaching in Academic Nursing. (2) Prerequisite(s): Admission to the major. Focuses on essential leadership and teaching principles for nurse scientist in an academic role. Emphasizes leadership skills such as academic budgets, planning, evaluation, accreditation, and funding innovation. In addition, best practices of teaching learning, theories of learning, curriculum building, and evaluation, and the role of academic service are included.

NURS 8207. Application of Qualitative Research Methods. (3) Prerequisite(s): Admission to the major. Focuses on applying qualitative methods in nursing research. Students will use different methods for collecting qualitative data, recording it, and begin the coding and analytic process.

NURS 8999. Dissertation Research. (3 to 6) Prerequisite(s): Admission to the major. Individual investigation under the direction of a dissertation advisor and committee where students design and execute an original research study leading to the completion of the dissertation. This research should address a significant issue in nursing or health care. *May be repeated for credit.*

Operations Management (OPER)

OPER 8122. Technology Enhanced Decision Making. (3) Prerequisite(s): MBAD 5141 and MBAD 5142 or equivalents. An analytical approach to the management process. Generalized models for decision making with major emphasis on application of the scientific method to management problems.

OPER 8208. Supply Chain Management. (3) Prerequisite(s): MBAD 6141. Pre- or Corequisite(s): MBAD 6122 or permission of department. Supply chain management is concerned with all of the activities performed from the initial raw materials to the ultimate consumption of the finished product. From a broad perspective, the course is designed to examine the major aspects of the supply chain: the product flows; the information flows; and the relationships among supply chain participants. The course content is interdisciplinary in nature and will cover a variety of topics such as supply chain information technologies, supply chain design, strategic alliances between supply chain participants and supply chain initiatives.

Operations Research (OPRS)

OPRS 5113. Game Theory. (3) Prerequisite(s): OPRS 3111; and STAT 2122, MATH/STAT 3122, or OPRS 3113. The theory of zero-sum matrix games, mini-max theorem, optimal strategies, symmetric games, economic models, infinite, separable, polynomial, multi-stage, general-sum and n-person games. A project is required of all graduate students.

OPRS 5114. Dynamic Programming. (3) Prerequisite(s): ITCS 1214, OPRS 3111, and one of STAT 2122, MATH/STAT 3122 or OPRS 3113. The identification of dynamic programming problems and their solution in terms of recurrence relations. Elementary path problems, resource allocation, shortest path, traveling salesmen problem, discrete-time optimal control, replacement models and inventory systems. A project will be required of all graduate students.

Optical Science and Engineering (OPTI)

OPTI 5000. Selected Topics in Optics. (3) Prerequisite(s): Permission of Optics Program Director. Selected topics in optics from areas such as medical optics, adaptive optics, all optical networks, etc. *May be repeated for credit with change of topic.*

OPTI 5371. Waves and Optics. (3) Cross-listed Course(s): PHYS 5271. The mathematics of wave motion, light as an example of an electromagnetic wave, the superposition of periodic and non-periodic waves, and selected topics from geometrical and physical optics.

OPTI 5392. Solid State Microelectronic Devices. (3) Cross-listed Course(s): ECGR 5192. PN-junctions and Schottky junctions. Bipolar and field effect transistors. Optoelectronic and heterojunction devices. Lithography and integrated circuits. Microwave devices. Light emitting devices and detectors. Quantum devices using superlattices. Quantum wells and quantum dots. Material preparation and characterization. Measurement techniques.

OPTI 6000. Selected Topics in Optics. (3) Cross-listed Course(s): OPTI 8000. Prerequisite(s): Permission of Optics Program Director. Selected topics in optics from areas such as medical optics, adaptive optics, all optical networks, etc. *May be repeated for credit with change of topic.*

OPTI 6101. Mathematical Methods of Optical Science and Engineering. (3) Cross-listed Course(s): OPTI 8101. A comprehensive look at those mathematical techniques important to the understanding of optical phenomena. Includes vector algebra and calculus, matrix theory, Fourier series and transforms, complex analysis, solution of boundary value problems in partial differential equations, and special functions. Topical coverage emphasizes applications specific to the field of optics.

OPTI 6102. Principles of Geometrical Optics. (3) Cross-listed Course(s): OPTI 8102. Law of reflection and refraction, reflection and refraction at plane surfaces, paraxial imagery, mirrors, thick lenses, thin lenses, lens systems, stops, principle planes, the optical variant, vignetting, paraxial radiometry, analysis of common optical systems, real ray tracing, and introduction to aberrations and image resolution in the context of the modulation transfer function.

OPTI 6102L. Geometrical Optics Lab. (1) Cross-listed Course(s): OPTI 8102L. Selected experiments in areas of geometrical optics such as index of refraction measurement, dispersing and reflecting prisms, spherical mirrors and thin lenses, imaging, optical instruments, aberration, fiber optics, and fringe projection profilometry.

OPTI 6103. Light Sources and Detectors. (3) Cross-listed Course(s): OPTI 8103. Photon statistics and thermal light. Interactions of photons with atoms. Population inversion, lasing threshold, and resonator modes. Mode-locked and Q-switched lasers. Semiconductor photon sources including light-emitting diodes (LEDs) and laser diodes. Quantum-confined structures, materials, and devices. Thermal sources. Light extraction. Light detectors including photoconductive, photovoltaic and avalanche photodiodes. Noise in light sources and detectors.

OPTI 6104. Electromagnetic Waves. (3) Cross-listed Course(s): OPTI 8104. Optical phenomena that are explicitly associated with the electromagnetic nature of light. Includes an introduction to Maxwell's equations, and electromagnetic waves. Polarization and the Jones calculus. Energy and momentum conservation, boundary conditions and Fresnel equations. Waves in anisotropic (birefringent) and complex media. Modulation and deflection of optical beams (principles of acousto-optics and electro-optic devices). Propagation at interfaces, waveguides, and plasmons. Electromagnetic potentials and multipole radiation, scattering of light, and interaction with metallic nanoparticles.

OPTI 6105. Optical Properties of Materials. (3) Cross-listed Course(s): OPTI 8105. Electromagnetic wave propagation in dielectrics, semiconductors and metals. Dipole oscillator model, complex dielectric constants, and Kramers-Kronig relationship. Crystal structures and optical anisotropy.

Reciprocal space and density of states. Electronic band structure. Quantum theory of radiative absorption and emission, selection rules. Direct and indirect interband absorption. Free-carrier absorption in metals and doped semiconductors. Free excitons and Frenkel excitons. Photo- and electroluminescence in semiconductors. Optical absorption and emission in quantum wells and quantum dots, and quantum Stark effect. Second and third-order optical nonlinearities.

OPTI 6106. Principles of Physical Optics. (3) Cross-listed Course(s): OPTI 8106. The Fourier transform and its role in wave optics. Wave properties of light, superposition of waves, angular spectrum of plane waves, relation to ray optics, Gaussian beams, periodic structures and surfaces, Fresnel diffraction, spatial filtering diffraction, interference and interferometers (two, multibeam, Fabry-Perot), polarization, temporal and spatial coherence, holography, imaging and resolution.

OPTI 6106L. Physical Optics Lab. (2) Cross-listed Course(s): OPTI 8106L. Selected experiments in areas of physical optics such as interference in thin films, Fabry-Perot, Michelson & Twyman-Green interferometers, polarization and diffraction of light. By the end of this course, students are asked to design and implement a mini project that includes geometrical and physical optics concepts.

OPTI 6201. Fourier Optics and Holography. (3) Cross-listed Course(s): OPTI 8201. Prerequisite(s): OPTI 6102 and OPTI 6104. Principles of scalar, Fresnel, and Fraunhofer diffraction theory. Coherent optical data processing. Optical filtering and data processing. Holography. Three lecture hours per week.

OPTI 6202. Fundamentals of Biomedical Optics. (3) Cross-listed Course(s): OPTI 8202 and PHYS 6202. Basic principles underlying tissue optics, laser-tissue interactions, and optical imaging, microscopy, and spectroscopy for medical applications.

OPTI 6203. Metamaterials. (3) Cross-listed Course(s): OPTI 8203. Metamaterials describes a new field of engineered materials having subwavelength structures, and which have electromagnetic properties not found in nature. Examples include zero and negative index materials which lead to some new applications. Metamaterials are made from "meta-atoms" which are much smaller than the wavelength of the radiation. Meta-atoms are LCR circuits having strong resonant behavior over some chosen bandwidth. The distribution of many such atoms and their mutual interaction determine the bulk metamaterial's properties. Describing these properties draws from electromagnetics, antenna design, atomic and molecular physics and condensed matter physics. At increasingly small scales (i.e., at the nanoscale), both quantum and plasmonic phenomena can play a role.

OPTI 6205. Advanced Optical Materials. (3) Cross-listed Course(s): OPTI 8205. Prerequisite(s): OPTI 6104 and OPTI 6105. Molecular optical materials including fabrication methods. Luminescence centers; quenching. Nonlinear optics, including higher order terms of the susceptibility tensor. Photonic crystals. Three lecture hours per week.

OPTI 6206. Physical Optics Design and Simulation. (3) Cross-listed Course(s): OPTI 8206. Prerequisite(s): OPTI 6106 or permission of instructor. Design and simulation of optical components and systems using scalar and vector wave propagation, diffraction, and interference. The course is intended to complement OPTI 6241, which focuses on optical lens and system design using geometrical ray-tracing.

OPTI 6211. Introduction to Modern Optics. (3) Cross-listed Course(s): OPTI 8211. Prerequisite(s): OPTI 6102 or permission of instructor. Fourier analysis and holography, Coherence. Introduction to light production and detection. Optical modulation, including EO effect, Kerr effect, amplitude modulation, magneto-optic effect, photoelastic effect, and acousto-optic effect. Introduction to nonlinear optics. Photonic switching. Three lecture hours per week.

OPTI 6212. Integrated Photonics. (3) Cross-listed Course(s): OPTI 8212. Prerequisite(s): OPTI 6102 and OPTI 6104. Theory and application of optical waveguides, free-space micro-optics, and integrated photonic devices. Fabrication and integration techniques, including motivations for choice of approach (hybrid vs. monolithic, materials, size, performance, etc). Modeling and simulation. Students will be required to work with mathematical packages such as Matlab and/or Mathematica to illustrate key concepts and to implement beam propagation/optical modeling simulations. Three lecture hours per week.

OPTI 6221. Optical Communications. (3) Cross-listed Course(s): OPTI 8221. Prerequisite(s): OPTI 6102 and OPTI 6103. Introduction to optical communications and basic communication block such as lasers, optical modulators, and optical transceivers. Review of fibers (attenuation, dispersions, etc.). Optical amplifiers. Passive and active photonic components such as tunable lasers and filters. Coherent and incoherent detection. Signal processing, photonic switching, and point-to-point links / connections. Three lecture hours per week.

OPTI 6222. Optical Communication Networks. (3) Cross-listed Course(s): OPTI 8222. Prerequisite(s): OPTI 6221 or graduate standing in ECE, CS, or IT. Optical signal coding, multiplexing and de-multiplexing. Time-domain medium access (TDM (SONET) and TDMA), wavelength-division multiplexing (WDM and WDMA). Optical networks, add-drop multiplexing (OADM), switching and routing technologies, Dispersion management. Optical clock and

timing recovery. Optical amplification, wavelength conversion, transport, and networking protocols. Broadband ISDN concepts. Access, metro, and long-haul network topologies. Three lecture hours per week.

OPTI 6241. Optical System Function and Design. (3) Cross-listed Course(s): OPTI 8241. Prerequisite(s): OPTI 6102. Advanced study of telescopes, microscopes, cameras, off-axis imaging systems, stops, apertures, multiple lenses, use and selection of ray trace computer codes. Three lecture hours per week.

OPTI 6242. Optical Propagation in Inhomogeneous Media. (3) Cross-listed Course(s): OPTI 8242. Prerequisite(s): OPTI 6102 and OPTI 6104. Advanced study of free space propagation, scattering, and scintillation of Gaussian and uniform beam waves. Random processes, weak fluctuation theory, propagation through complex paraxial optical systems.

OPTI 6244. High Speed Photonics and Optical Instrumentation. (3) Cross-listed Course(s): OPTI 8244. Prerequisite(s): OPTI 6103 and OPTI 6104. Study of instrumentation used for generation, detection, and manipulation of light in optical circuits. Topics include: ultrashort pulse generation, photon-phonon interactions, 2nd & 3rd harmonic generation, squeezed light, optical tweezers, OPO, electro-optic modulators, selective polarizers, optical switches, amplifiers, multiplexing and mixing schemes, and application of CCD and CMOS cameras and detectors. Three lecture hours per week.

OPTI 6261. Modern Coherence Theory. (3) Cross-listed Course(s): OPTI 8261. Prerequisite(s): OPTI 6102 and OPTI 6104. Stochastic processes. Second order coherence of scalar and vector wavefields, radiation and states of coherence. Quantum wavefields.

OPTI 6271. Advanced Physical Optics. (3) Cross-listed Course(s): OPTI 8271. Prerequisite(s): OPTI 6101, OPTI 6102, and OPTI 6104. Advanced study of electromagnetic wave propagation, stratified media, physics of geometrical optics, polarization and crystal optics, absorption and dispersion, interference, propagation and diffraction. Three lecture hours per week.

OPTI 6281. Modern Optics Laboratory. (3) Cross-listed Course(s): OPTI 8281. Prerequisite(s): OPTI 6102. Selected experiments in areas of modern optics such as fiber optics, interferometry, spectroscopy, polarization, optical metrology, and holography. Six laboratory hours per week.

OPTI 6301. Introduction to Instrumentation and Processing at the Nanoscale. (3) Cross-listed Course(s): OPTI 8301 and NANO 8101. Methods of manipulating, engineering, and characterizing nanoscale materials are introduced;

applications and principles of their operation are discussed. Students acquire hands-on experience with selected laboratory methods in preparation for dissertation research. Topics include, but are not limited to, scanning probe and electron microscopy methods, cleanroom technology, nanoscale optical and e-beam lithography, nuclear magnetic resonance, mass spectrometry, luminescence methods, interferometry, gel permeation chromatography, surface area analysis, and small-angle x-ray and neutron scattering.

OPTI 6302. Nanoscale Phenomena. (3) Cross-listed Course(s): OPTI 8302, CHEM 6102, and NANO 8102. Nano-optics (near-field optics, limits of lithography masks, nano-dots and nanoscale optical interactions). Nanoscale mechanics. Nanotribology. Biological and biologically-inspired machines.

OPTI 6303. Collaborative Research Proposal. (3) Cross-listed Course(s): OPTI 8303 and NANO 8203. Effective strategies for designing and writing research proposals are presented by program faculty members, and staff from proposal development offices on campus. Students work in teams of 2-3 to prepare an original, interdisciplinary research proposal on a topic in nanoscale science. The proposal conforms to regulations of a selected funding agency and must address a topic that is supported by that agency. Each team consults regularly with a panel of 2-3 faculty members who collectively approve the proposal topic, provide feedback during the development of the proposal, and ultimately evaluate the proposal. The course is designed to increase the ability of students to relate research ideas to fundamental concepts in science and engineering, to help students learn to develop effective methods of presenting ideas and defending them, to help students develop self confidence in their abilities to present and defend ideas, and to improve oral and written communication skills.

OPTI 6341. Applied Quantum Mechanics. (3) Cross-listed Course(s): OPTI 8341 and PHYS 6141. Principles of non-relativistic wave mechanics. The Schrodinger equation, linear harmonic oscillator and WKB approximation. Central forces and angular momentum. The hydrogen atom. Applications of quantum mechanics in materials and optics.

OPTI 6371. Solid State Materials. (3) Cross-listed Course(s): ECGR 6132, ECGR 8132, OPTI 8371, and PHYS 6181. Crystal structure. Electromagnetic, electron, mechanical, and elastic wave interactions with crystals. Theory of X-ray diffraction. Energy band theory of metals and semiconductors. Optical properties of solids, phase transitions, and amorphous solids. Quantum mechanics of covalent bonding, phonon excitation, and thermal energy.

OPTI 6381. Engineering Metrology. (3) Cross-listed Course(s): MEGR 6181, MEGR 8181, and OPTI 8381. Introduction to metrology and standards. Uncertainty, precision and accuracy in metrology. Measurement of size and form, computational methods in measurement of form. Measurement of surface texture and out of roundness. Machine tool and robot accuracy and calibration. Evaluation of screw threads and gears. Introduction to design of precision instruments.

OPTI 6384. Advanced Surface Metrology. (3) Cross-listed Course(s): MEGR 7284, MEGR 8284, and OPTI 8384. Prerequisite(s): OPTI 6381, OPTI 8381, or permission of instructor. Constituents of surface texture, stylus, optical, atomic force microscope and other advanced methods of measuring surface texture. Two and three dimensional measurement of surfaces. Separation of form, waviness and roughness. Random process analysis techniques, use of transforms for filtering. Numerical evaluation of surface texture. Use of surface texture as fingerprint of the process. Relationship between function and surface texture.

OPTI 6400. Industrial Internship. (1 to 3) Cross-listed Course(s): OPTI 8400. Prerequisite(s): Completion of nine hours of graduate coursework and permission of program director. Full- or part-time academic year internship in optical science/optical engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Requires a mid-term report and final report to be graded by the supervising faculty. *May be repeated for credit.*

OPTI 6610. Seminar. (1) Cross-listed Course(s): OPTI 8610. Utilizing library resources, materials, and research tools. Using presentation software and developing presentation skills for effective technical presentations. Patents and technology transfer. Ethical issues in science and engineering. Current topics in optics.

OPTI 6611. Graduate Colloquium. (1) Cross-listed Course(s): OPTI 8611. Students present seminars on current topics in optical science and engineering. *May be repeated for credit.*

OPTI 6800. Independent Study. (1 to 3) Cross-listed Course(s): OPTI 8800. Prerequisite(s): Permission of the Optics Program Director. Independent study pursued by the student, or a group of students, under the direction of a professor. *May be repeated for credit up to 6 credits.*

OPTI 6991. Thesis Research. (1 to 3) Research for the thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit.*

OPTI 8000. Selected Topics in Optics. (3) Cross-listed Course(s): OPTI 6000. Prerequisite(s): Permission of Optics Program Director. Selected topics in optics from areas such as medical optics, adaptive optics, all optical networks, etc. *May be repeated for credit with change of topic.*

OPTI 8101. Mathematical Methods of Optical Science and Engineering. (3) Cross-listed Course(s): OPTI 6101. A comprehensive look at those mathematical techniques important to the understanding of optical phenomena. Includes vector algebra and calculus, matrix theory, Fourier series and transforms, complex analysis, solution of boundary value problems in partial differential equations, and special functions. Topical coverage emphasizes applications specific to the field of optics.

OPTI 8102. Principles of Geometrical Optics. (3) Cross-listed Course(s): OPTI 6102. Law of reflection and refraction, reflection and refraction at plane surfaces, paraxial imagery, mirrors, thick lenses, thin lenses, lens systems, stops, principle planes, the optical variant, vignetting, paraxial radiometry, analysis of common optical systems, real ray tracing, and introduction to aberrations and image resolution in the context of the modulation transfer function.

OPTI 8102L. Geometrical Optics Lab. (1) Cross-listed Course(s): OPTI 6102L. Selected experiments in areas of geometrical optics such as index of refraction measurement, dispersing and reflecting prisms, spherical mirrors and thin lenses, imaging, optical instruments, aberration, fiber optics, and fringe projection profilometry.

OPTI 8103. Light Sources and Detectors. (3) Cross-listed Course(s): OPTI 6103. Photon statistics and thermal light. Interactions of photons with atoms. Population inversion, lasing threshold, and resonator modes. Mode-locked and Q-switched lasers. Semiconductor photon sources including light-emitting diodes (LEDs) and laser diodes. Quantum-confined structures, materials, and devices. Thermal sources. Light extraction. Light detectors including photoconductive, photovoltaic and avalanche photodiodes. Noise in light sources and detectors.

OPTI 8104. Electromagnetic Waves. (3) Cross-listed Course(s): OPTI 6104. Optical phenomena that are explicitly associated with the electromagnetic nature of light. Includes an introduction to Maxwell's equations, and electromagnetic waves. Polarization and the Jones calculus. Energy and momentum conservation, boundary conditions and Fresnel equations. Waves in anisotropic (birefringent) and complex media. Modulation and deflection of optical beams (principles of acousto-optics and electro-optic devices). Propagation at interfaces, waveguides, and plasmons. Electromagnetic potentials and

multipole radiation, scattering of light, and interaction with metallic nanoparticles.

OPTI 8105. Optical Properties of Materials. (3) Cross-listed Course(s): OPTI 6105. Electromagnetic wave propagation in dielectrics, semiconductors and metals. Dipole oscillator model, complex dielectric constants, and Kramers-Kronig relationship. Crystal structures and optical anisotropy. Reciprocal space and density of states. Electronic band structure. Quantum theory of radiative absorption and emission, selection rules. Direct and indirect interband absorption. Free-carrier absorption in metals and doped semiconductors. Free excitons and Frenkel excitons. Photo- and electroluminescence in semiconductors. Optical absorption and emission in quantum wells and quantum dots, and quantum Stark effect. Second and third-order optical nonlinearities.

OPTI 8106. Principles of Physical Optics. (3) Cross-listed Course(s): OPTI 6106. The Fourier transform and its role in wave optics. Wave properties of light, superposition of waves, angular spectrum of plane waves, relation to ray optics, Gaussian beams, periodic structures and surfaces, Fresnel diffraction, spatial filtering diffraction, interference and interferometers (two, multibeam, Fabry-Perot), polarization, temporal and spatial coherence, holography, imaging and resolution.

OPTI 8106L. Physical Optics Lab. (2) Cross-listed Course(s): OPTI 6106L. Selected experiments in areas of physical optics such as interference in thin films, Fabry-Perot, Michelson & Twyman-Green interferometers, polarization and diffraction of light. By the end of this course, students are asked to design and implement a mini project that includes geometrical and physical optics concepts.

OPTI 8201. Fourier Optics and Holography. (3) Cross-listed Course(s): OPTI 6201. Prerequisite(s): OPTI 8102 and OPTI 8104. Principles of scalar, Fresnel, and Fraunhofer diffraction theory. Coherent optical data processing. Optical filtering and data processing. Holography. Three lecture hours per week.

OPTI 8202. Fundamentals of Biomedical Optics. (3) Cross-listed Course(s): OPTI 6202 and PHYS 6202. Basic principles underlying tissue optics, laser-tissue interactions, and optical imaging, microscopy, and spectroscopy for medical applications.

OPTI 8203. Metamaterials. (3) Cross-listed Course(s): OPTI 6203. Metamaterials describes a new field of engineered materials having subwavelength structures, and which have electromagnetic properties not found in nature. Examples include zero and negative index materials which lead to some new applications. Metamaterials are made from "meta-atoms" which are much smaller than the wavelength of the radiation. Meta-atoms are LCR circuits

having strong resonant behavior over some chosen bandwidth. The distribution of many such atoms and their mutual interaction determine the bulk metamaterial's properties. Describing these properties draws from electromagnetics, antenna design, atomic and molecular physics and condensed matter physics. At increasingly small scales (i.e., at the nanoscale), both quantum and plasmonic phenomena can play a role.

OPTI 8205. Advanced Optical Materials. (3) Cross-listed Course(s): OPTI 6205. Prerequisite(s): OPTI 8104 and OPTI 8105. Molecular optical materials including fabrication methods. Luminescence centers; quenching. Nonlinear optics, including higher order terms of the susceptibility tensor. Photonic crystals. Three lecture hours per week.

OPTI 8206. Physical Optics Design and Simulation. (3) Cross-listed Course(s): OPTI 6206. Prerequisite(s): OPTI 8106 or permission of instructor. Design and simulation of optical components and systems using scalar and vector wave propagation, diffraction, and interference. The course is intended to complement OPTI 8241, which focuses on optical lens and system design using geometrical ray-tracing.

OPTI 8211. Introduction to Modern Optics. (3) Cross-listed Course(s): OPTI 8211. Prerequisite(s): OPTI 6102 or permission of instructor. Fourier analysis and holography, Coherence. Introduction to light production and detection. Optical modulation, including EO effect, Kerr effect, amplitude modulation, magneto-optic effect, photoelastic effect, and acousto-optic effect. Introduction to nonlinear optics. Photonic switching. Three lecture hours per week.

OPTI 8212. Integrated Photonics. (3) Cross-listed Course(s): OPTI 6212. Prerequisite(s): OPTI 8102 and OPTI 8104. Theory and application of optical waveguides, free-space micro-optics, and integrated photonic devices. Fabrication and integration techniques, including motivations for choice of approach (hybrid vs. monolithic, materials, size, performance, etc). Modeling and simulation. Students will be required to work with mathematical packages such as Matlab and/or Mathematica to illustrate key concepts and to implement beam propagation/optical modeling simulations. Three lecture hours per week.

OPTI 8221. Optical Communications. (3) Cross-listed Course(s): OPTI 6221. Prerequisite(s): OPTI 8102 and OPTI 8103. Introduction to optical communications and basic communication block such as lasers, optical modulators, and optical transceivers. Review of fibers (attenuation, dispersions, etc.). Optical amplifiers. Passive and active photonic components such as tunable lasers and filters. Coherent and incoherent detection. Signal processing, photonic switching, and point-to-point links / connections. Three lecture hours per week.

OPTI 8222. Optical Communication Networks. (3) Cross-listed Course(s): OPTI 6222. Prerequisite(s): OPTI 8221. Optical signal coding, multiplexing and de-multiplexing. Time-domain medium access (TDM (SONET) and TDMA), wavelength-division multiplexing (WDM and WDMA). Optical networks, add-drop multiplexing (OADM), switching and routing technologies, Dispersion management. Optical clock and timing recovery. Optical amplification, wavelength conversion, transport, and networking protocols. Broadband ISDN concepts. Access, metro, and long-haul network topologies. Three lecture hours per week.

OPTI 8241. Optical System Function and Design. (3) Cross-listed Course(s): OPTI 6241. Prerequisite(s): OPTI 8102. Advanced study of telescopes, microscopes, cameras, off-axis imaging systems, stops, apertures, multiple lenses, use and selection of ray trace computer codes. Three lecture hours per week.

OPTI 8242. Optical Propagation in Inhomogeneous Media. (3) Cross-listed Course(s): OPTI 6242. Prerequisite(s): OPTI 8102 and OPTI 8104. Advanced study of free space propagation, scattering, and scintillation of Gaussian and uniform beam waves. Random processes, weak fluctuation theory, propagation through complex paraxial optical systems.

OPTI 8244. High Speed Photonics and Optical Instrumentation. (3) Cross-listed Course(s): OPTI 6244. Prerequisite(s): OPTI 8103 and OPTI 8104. Study of instrumentation used for generation, detection, and manipulation of light in optical circuits. Topics include: ultrashort pulse generation, photon-phonon interactions, 2nd & 3rd harmonic generation, squeezed light, optical tweezers, OPO, electro-optic modulators, selective polarizers, optical switches, amplifiers, multiplexing and mixing schemes, and application of CCD and CMOS cameras and detectors. Three lecture hours per week.

OPTI 8261. Modern Coherence Theory. (3) Cross-listed Course(s): OPTI 6261. Prerequisite(s): OPTI 8102 and OPTI 8104. Stochastic processes. Second order coherence of scalar and vector wavefields, radiation and states of coherence. Quantum wavefields.

OPTI 8271. Advanced Physical Optics (3) Cross-listed Course(s): OPTI 6271. Prerequisite(s): OPTI 8101, OPTI 8102, and OPTI 8104. Advanced study of electromagnetic wave propagation, stratified media, physics of geometrical optics, polarization and crystal optics, absorption and dispersion, interference, propagation and diffraction. Three lecture hours per week.

OPTI 8281. Modern Optics Laboratory. (3) Cross-listed Course(s): OPTI 6281. Prerequisite(s): OPTI 8102. Selected experiments in areas of modern optics such as fiber optics,

interferometry, spectroscopy, polarization, optical metrology, and holography. Six laboratory hours per week.

OPTI 8301. Introduction to Instrumentation and Processing at the Nanoscale. (3) Cross-listed Course(s): OPTI 6301 and NANO 8101. Methods of manipulating, engineering, and characterizing nanoscale materials are introduced; applications and principles of their operation are discussed. Students acquire hands-on experience with selected laboratory methods in preparation for dissertation research. Topics include, but are not limited to, scanning probe and electron microscopy methods, cleanroom technology, nanoscale optical and e-beam lithography, nuclear magnetic resonance, mass spectrometry, luminescence methods, interferometry, gel permeation chromatography, surface area analysis, and small-angle x-ray and neutron scattering.

OPTI 8302. Nanoscale Phenomena. (3) Cross-listed Course(s): OPTI 6302, CHEM 6102, and NANO 8102. Nano-optics (near-field optics, limits of lithography masks, nano-dots and nanoscale optical interactions). Nanoscale mechanics. Nanotribology. Biological and biologically-inspired machines.

OPTI 8303. Collaborative Research Proposal. (3) Cross-listed Course(s): OPTI 6303 and NANO 8203. Effective strategies for designing and writing research proposals are presented by program faculty members, and staff from proposal development offices on campus. Students work in teams of 2-3 to prepare an original, interdisciplinary research proposal on a topic in nanoscale science. The proposal conforms to regulations of a selected funding agency and must address a topic that is supported by that agency. Each team consults regularly with a panel of 2-3 faculty members who collectively approve the proposal topic, provide feedback during the development of the proposal, and ultimately evaluate the proposal. The course is designed to increase the ability of students to relate research ideas to fundamental concepts in science and engineering, to help students learn to develop effective methods of presenting ideas and defending them, to help students develop self confidence in their abilities to present and defend ideas, and to improve oral and written communication skills.

OPTI 8341. Applied Quantum Mechanics. (3) Cross-listed Course(s): OPTI 6341 and PHYS 6141. Principles of non-relativistic wave mechanics. The Schrodinger equation, linear harmonic oscillator and WKB approximation. Central forces and angular momentum. The hydrogen atom. Applications of quantum mechanics in materials and optics.

OPTI 8371. Solid State Materials. (3) Cross-listed Course(s): ECCR 6132, ECCR 8132, OPTI 6371, and PHYS 6181. Crystal

structure. Electromagnetic, electron, mechanical, and elastic wave interactions with crystals. Theory of X-ray diffraction. Energy band theory of metals and semiconductors. Optical properties of solids, phase transitions, and amorphous solids. Quantum mechanics of covalent bonding, phonon excitation, and thermal energy.

OPTI 8381. Engineering Metrology. (3) Cross-listed Course(s): MEGR 6181, MEGR 8181, and OPTI 6381. Introduction to metrology and standards. Uncertainty, precision and accuracy in metrology. Measurement of size and form, computational methods in measurement of form. Measurement of surface texture and out of roundness. Machine tool and robot accuracy and calibration. Evaluation of screw threads and gears. Introduction to design of precision instruments.

OPTI 8384. Advanced Surface Metrology. (3) Cross-listed Course(s): MEGR 7284, MEGR 8284, and OPTI 6384. Prerequisite(s): OPTI 6381, OPTI 8381, or permission of instructor. Constituents of surface texture, stylus, optical, atomic force microscope and other advanced methods of measuring surface texture. Two and three dimensional measurement of surfaces. Separation of form, waviness and roughness. Random process analysis techniques, use of transforms for filtering. Numerical evaluation of surface texture. Use of surface texture as fingerprint of the process. Relationship between function and surface texture.

OPTI 8400. Industrial Internship. (1 to 3) Cross-listed Course(s): OPTI 6400. Prerequisite(s): Completion of nine hours of graduate coursework and permission of program director. Full- or part-time academic year internship in optical science/optical engineering complementary to the major course of studies and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Requires a mid-term report and final report to be graded by the supervising faculty. *May be repeated for credit.*

OPTI 8610. Seminar. (1) Cross-listed Course(s): OPTI 6610. Utilizing library resources, materials, and research tools. Using presentation software and developing presentation skills for effective technical presentations. Patents and technology transfer. Ethical issues in science and engineering. Current topics in optics.

OPTI 8611. Graduate Colloquium. (1) Cross-listed Course(s): OPTI 6611. Students present seminars on current topics in optical science and engineering. *May be repeated for credit.*

OPTI 8800. Independent Study. (1 to 3) Cross-listed Course(s): OPTI 6800. Prerequisite(s): Permission of the Optics Program Director. Independent study pursued by

the student, or a group of students, under the direction of a professor. *May be repeated for credit up to 6 credits.*

OPTI 8991. Dissertation Research. (1 to 3) Research for the dissertation. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Organizational Science (OSCI)

OSCI 8000. Organizational Science Overview. (3)
Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Provides broad overview of the field of Organizational Science including its historical foundations. Each week is a mini-seminar on a particular topic within the field.

OSCI 8001. Current Topics and Events in Organizational Science. (1) Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. New and innovative research and practice topics related to Organizational Science will be discussed / delivered / facilitated by student researchers, faculty and invited speakers. These “cutting edge” topics will span all of micro and macro organizational science and will change each semester. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

OSCI 8003. Writing and Publishing in Organizational Science. (1 to 3) Cross-listed Course(s): PSYC 6003. Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Seminar to enhance effective technical/scientific writing (e.g., learning APA style, presentation of statistical analyses) and understanding the publication process (e.g., selecting an appropriate outlet, preparing a manuscript, the review process). Students actively engage in writing, as well as the review process (as both a reviewer and author).

OSCI 8100. Organizational Science Lab. (1 to 2)
Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor and co-enrollment in OSCI 8000. Special topics seminar connected with the Organizational Science Overview course (typically taught by the same instructor). Topics cover the field of Organizational Science. Science/practice/research issues emphasized. The instructor determines whether the course is taken for a letter grade or Pass/Unsatisfactory.

OSCI 8102. Research Methodologies in Behavioral Sciences. (3) Cross-listed Course(s): HPSY 8102. Prerequisite(s): Admission to the Ph.D. in Organizational Science program, or by permission of instructor. This

interdisciplinary course provides a broad overview of the major research methodologies and methodological considerations in the behavioral sciences. Using examples drawn from the literature, the course focuses on general principles and perspectives of social science research. Topics include: foundational concepts across the behavioral sciences (e.g., sampling, measurement, ethics, logic of hypothesis testing, etc.), and the evaluation of specific methodologies (e.g., experimentation, observation, survey, archival, epidemiological/ecological designs, etc.). Practical research considerations are also covered (e.g., basics of APA writing, IRB process and forms, data management and data cleaning, development of experimental protocols, etc.).

OSCI 8103. Basic Quantitative Analyses for Behavioral Sciences. (3) Cross-listed Course(s): HPSY 8103. Prerequisite(s): OSCI 8102. Introduction to quantitative data analysis and interpretation. Focuses on the strategic application of the multiple regression and correlational framework (including specific instantiations such as ANOVA, path analyses, etc.) including the incorporation of manipulated or categorical independent and categorical dependent variables.

OSCI 8130. Social Psychology. (3) Cross-listed Course(s): PSYC 6130. Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Human social behavior; topics include affiliation, person perception, conformity and attitudes.

OSCI 8206. Qualitative Research Methods. (3) (s): Full graduate standing in the Ph.D. program in Organizational Science or permission of instructor. Examines qualitative approaches to Organizational Science research such as focus groups, verbal protocol, interviewing, naturalistic observation, and content analysis.

OSCI 8208. Advanced Qualitative Data Analysis. (3)
Prerequisite(s): OSCI 8206 or permission of instructor. This course extends the foundational approaches presented in OSCI 8206 to provide advanced instruction on the assumptions, contingencies, techniques, and practices of computer-supported qualitative data analysis systems (CAQDAS). Students will work with several advanced software packages that facilitate the management, analysis, and display of qualitative data.

OSCI 8477. Organizational Science Practicum. (1 to 6)
Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Practical experience/Internship in an organizational setting. With permission from the program director, a research assistantship on a grant can fulfill this requirement. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

OSCI 8610. Micro Organizational Science I. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Examines research, theory and application regarding individual differences (e.g., abilities, personality), assessment (e.g., tests, inventories, interviews, assessment centers), criterion development (e.g., job analysis, performance models) and organizational staffing processes (i.e., recruitment, selection, basic legal concepts).

OSCI 8611. Macro Organizational Science I (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Examines research, theory and application on the following topics: motivation, communication systems and processes, stress, job design, leadership, employee attitudes and emotions, teamwork, and decision making.

OSCI 8620. Micro Organizational Science II. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Examines research, theory and application regarding post-entry personnel issues such as training, performance management, performance appraisal, compensation, and employee socialization.

OSCI 8621. Macro Organizational Science II. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Examines research, theory and application on the following topics: organizational development, organizational change, organizational climate, organizational culture, organizational theory, and relations between organizations and their environment.

OSCI 8630. Micro Seminar in Organizational Science. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Examination of special topic(s) germane to Micro Organizational Science. The seminar may focus on one or a small number of topics salient to this area. Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

OSCI 8640. Macro Seminar in Organizational Science. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Examination of special topic(s) germane to Macro Organizational Science. The seminar may focus on one or a small number of topics salient to this area. Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit with change of topic.*

OSCI 8650. Research Methods Seminar in Organizational Science. (3) Cross-listed Course(s): PSYC 6650.

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Examination of special topic(s) germane to research methods in Organizational Science. The seminar may focus on one or a small number of topics that define this area (e.g., a data analytic technique, a methodological approach). Extensive reading and discussion of topics from multiple perspectives. *May be repeated for credit.*

OSCI 8899. Organizational Science Readings and Research. (1 to 3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Research and/or reading on a topic agreed on by a student and a faculty member. These elective hours may also be used toward the Graduate School's 18-credit hour dissertation research requirement once 12 dissertation credit hours (6 from OSCI 8998 and 6 from OSCI 8999) are met. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

OSCI 8948. Independent Pre-Doctoral Organizational Science Research Project I. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Identification of a focused research question and development of a research proposal comparable in scope to a Master's thesis. Conducted under the direction of a research chair and committee. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

OSCI 8949. Independent Pre-Doctoral Organizational Science Research Project II. (3)

Prerequisite(s): OSCI 8948 and Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Research and defense of on an Independent Pre-Doctoral Research Project conducted under the direction of a research chair and committee. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit.*

OSCI 8998. Organizational Science Dissertation I. (6)

Prerequisite(s): Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Identification of a research question and development of the proposal for a research study appropriate a dissertation project. Conducted under the direction of a research chair and committee. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

OSCI 8999. Organizational Science Dissertation II. (6)

Prerequisite(s): OSCI 8998 and Full graduate standing in the Ph.D. in Organizational Science program or permission of instructor. Research and defense of on an Independent Dissertation Project conducted under the direction of a research chair and committee. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit.*

Philosophy (PHIL)

PHIL 5009. Major Figure in Philosophy: Alein Locke. (3) An investigation into the thoughts and writings of a major figure in philosophy with special emphasis on primary sources. *May be repeated for credit with change of topic.*

PHIL 5050. Topics in Philosophy. (1 to 3) Prerequisite(s): Permission of the department. In-depth treatment of selected problems and issues in philosophy. *May be repeated for credit with change of topic.*

PHIL 5170. Queer Theory. (3) Introduction to key issues in queer theory, a field of studies that questions and redefines the identity politics of early lesbian and gay studies by investigating the socially constructed nature of identity and sexuality and critiquing normalizing ways of knowing and being.

PHIL 5180. Feminist Methods. (3) Feminist Methods takes as its primary concern the relation between theory and practice. Specifically, in the first half of the class, we consider some of the central concepts and questions that arise from feminist theory, starting from women of color and queer feminist theory. In the second half of the class, we consider how we ought to engage in feminism as a method, thinking specifically about research and pedagogy from marginalized positions.

PHIL 5190. Indigenous Feminisms. (3) Focuses on Indigenous feminist writings that both aim toward a constructive project of maintaining and respecting Indigenous ways of life and seek to address the detrimental consequences of U.S. and Canadian settler colonialism. Students begin with a theoretical analysis of key concepts such as settler colonialism, Indigeneity, gender, and institutional racism. Using these key concepts, students then examine present-day colonial formations, state-based efforts to address the needs of Indigenous communities, as well as collective strategies of resistance practiced by Indigenous women.

PHIL 5220. Data Ethics. (3) Study of ethical issues posed by the rise of big data and algorithmic systems. Topics may include privacy and surveillance, discrimination, methods of algorithmic governance, disability/access, artificial intelligence/machine learning, and critical theories of data.

PHIL 5230. After Auschwitz. (3) Centers around what it means to "go on"—to live and function and think—as an agent and as a human being in a world "after Auschwitz," taken expansively to refer to an entire century of genocides, mass murder, extreme violence, and depredation. Discussion may range across topics in ethics, aesthetics, politics, theology, or metaphysics. A central feature of the course will be to approach the issue in an

expansive way, so as to be able to benefit from an array of perspectives (e.g., bringing together Holocaust studies and postcolonial theory, or genocide studies and critical theory).

PHIL 6050. Topics in Philosophy. (1 to 3) Prerequisite(s): Permission of the department. In-depth treatment of selected problems and issues in philosophy. *May be repeated for credit with change of topic.*

PHIL 6110. Ethical Theory. (3) Examination of major normative and meta theories that undergird our practical judgments about morally right actions and morally good persons, organizations, or policies. This examination may include central problems and issues concerning morality's requirements (e.g., utility, duty, virtue, care), authority (e.g., absolutism, relativism, pluralism, multiculturalism), scope (e.g., deceased or future human beings, animals, environment), justification (e.g., rationality, intuition), source (e.g., reason, sentiment, disagreement), and nature (e.g., realism/antirealism, objectivity/subjectivity).

PHIL 6120. Philosophical Methods and Analysis. (3) Explores the distinctive and various methods within philosophy (logical, phenomenological, feminist, conceptual, linguistic, deconstructive, and others), their uses in particular contexts (including links to other disciplines), and how methodology shapes philosophy (including its social impact). One aim is to clarify "applied philosophy" by examining its methods. Students analyze, evaluate, reconstruct, and originate arguments, judgments, and decisions. They do so in connection with both texts shared among all the students in the class and the particular interests of individual students. Each student develops a paper over the course of the semester to bring these issues together.

PHIL 6130. Ethics, Security, Privacy, and Governance of Data for Social Good. (3) Ethical, privacy, and security concerns that arise in data science, with attention to the ways that governance policies and technological developments can either ameliorate or increase them. The course offers insights on the social impacts and potential benefits that data science and data scientists can provide to society.

PHIL 6220. Health Law and Ethics. (3) This course interprets and uses the main normative principles of bioethics (autonomy, non-maleficence, beneficence and justice) to guide the practice of healthcare professionals and policymakers. It also increases understanding, interpretation, and monitoring of the impact of legal, regulatory, and political environments on healthcare organizations. Topics include: medical malpractice, Medicare and Medicaid law, informed consent, privacy and confidentiality, reproductive freedom, death and dying, pain and suffering, allocation of scarce medical

resources, developments in genetics, and regenerative medicine.

PHIL 6240. Research Ethics in the Biological and Behavioral Sciences. (3) Cross-listed Course(s): GRAD 6240. Designed to identify the fundamental elements that characterize not only methodologically grounded but also morally appropriate scientific research. Class discussion and readings focus on key issues in biological and behavioral research including informed consent, privacy and confidentiality, risk-benefit assessments, mechanisms for protecting animal and human research subjects, international research, vulnerable populations, conflicts of interest and data management, publication ethics, intellectual property issues and the politics of research.

PHIL 6250. Ethics of Public Policy. (3) Examines the conceptual tools available in the development of policies, regulations and guidelines that are responsive to normative standards of character and conduct. The course will include discussion of ethical and political theory, as well as its intersection with policy-making at topics such as equity, efficiency, security, and liberty. Issues may include how specific policies express moral commitments and choices, how some policies favor certain values over others, as well as on issues such as whistle-blowing, "dirty hands" (doing wrong to do right), "many hands" (hiding accountability in bureaucracy) and professional incompetence.

PHIL 6260. Ethics and International Affairs. (3) The relations between nation states and other trans-national organizations are often assumed to be governed by realist power relations, and outside the scope of ethical deliberation. In this course we will examine what sorts of ethical norms can or should be brought to bear on international relations. Possible topic areas include both theoretical issues such as the applicability of ethical theory to the behavior of trans-cultural and international issues, the appropriateness of "Western" ethical norms to the discussion; as well as more specific topics such as global hunger, uneven development more generally, arms proliferation, and environmental security.

PHIL 6300. Latin American and Caribbean Thought. (3) An examination of Latin American and Caribbean philosophical thought from pre-conquest Indigenous worldviews to the present day. The course includes an emphasis on colonial and decolonial movements, as well as on ethnic, racial, class, national, and gender identities within Latin America and the Caribbean.

PHIL 6330. Race and Philosophy. (3) In this course, students will both study the role of race in the history of philosophy and examine, from a philosophical perspective, contemporary discourses of race and racism. Critical race theory and postcolonial theory will be studied, as well as

their intersection with feminism, queer theory, among other critical political philosophies.

PHIL 6340. Philosophy of Mind. (3) Examines questions concerning the relationship between body and mind, the existence of other minds, the nature of consciousness, and the architecture of cognition. Approaches to these questions include traditional philosophical sources (emphasizing metaphysics and epistemology) and more recent developments in cognitive science (including the computational model of mind, mental representation, connectionist systems, and artificial intelligence). Also addressed are ethical and social issues involved in the design and implementation of intelligent systems. Inquiries bear on issue such as free will and determinism, emotion and reasoning, and the nature of rationality.

PHIL 6410. Internship in Ethics and Applied Philosophy. (3) On-site work in ethics and applied philosophy. Site and workload to be determined in consultation with a business, agency, organization or association and one faculty-internship advisor. Provides practical and professional training experience under conditions that the University cannot duplicate.

PHIL 6602. Theoretical Approaches to Gender. (3) This course is an approach to the concept and the history of the concept of gender. It will tackle the question of how we are and become sexed, and critically explore the fluid boundary between the biological and the social. It will reflect on the intersection between sex, gender, and other identity categories, such as race, class, and sexuality, as well as on the differences in conceptual apparatuses used to understand the embodied experience of sex across national and linguistic paradigms. Topics may include the feminist critique of biological essentialism; gender as a continuum; the social construction of gender; gender performativity; historical changes in gender; masculinity studies.

PHIL 6627. Feminist Theory and Its Applications. (3) An interdisciplinary, intersectional, and transnational survey of the diverse body of feminist theories that analyze gender as a performative social construct in its intersections with other structures of power such as race, ethnicity, class, sexuality, nationality, ability, and religion. Conceptualizing feminism as a plural and heterogeneous political platform, the course examines significant conversations and debates in contemporary feminist theory.

PHIL 6800. Independent Study. (1 to 3) Prerequisite(s): Permission of the department. Directed individual study of a philosophical topic of special interest to the student. *May be repeated for credit up to 3 credits toward the Certificate in Applied Ethics and the M.A. in Ethics and Applied Philosophy programs.*

PHIL 6999. Master's Research Paper. (3) Prerequisite(s): Completion of 15 credit hours of PHIL graduate courses, and permission of department. Students begin with a previously submitted course paper and spend the semester revising it. The goal is for each student to produce a polished, professional paper worthy of submission to a philosophical journal. Additional reading and research on the topic is conducted, and multiple steps of revision and presentation of work in progress to the class are included. *May be repeated for credit with new material.*

PHIL 8240. Research Ethics in the Biological and Behavioral Sciences. (3) Cross-listed Course(s): GRAD 8240. See course listing for PHIL 6240 for the course description.

Physics (PHYS)

PHYS 5000. Selected Topics in Physics. (0 to 4) Prerequisite(s): Permission of instructor. Selected advanced topics in physics. *May be repeated for credit with permission of department.*

PHYS 5105. Fundamentals of Physics Teaching. (1) This is a 1 credit hour course intended to prepare students for the multitude of challenges and responsibilities as a Teaching Assistant (TA) for the Department of Physics and Optical Sciences. The class is designed for first time TAs and will introduce Physics teaching techniques and approaches and provide resources to enhance students' learning and classroom engagement. As a part of this class, we intend to help students develop equitable, evidence based and student-centered teaching practices. This course uses Canvas as a learning management system. Canvas can be accessed at canvas.uncc.edu.

PHYS 5151. Thermal Physics. (3) Cross-listed Course(s): PHYS 4151. Prerequisite(s): PHYS 3101 and PHYS 3141 with grades of C or above; and CHEM 125I, CHEM 125IL, and MATH 2241. An introduction to heat, thermodynamics, kinetic theory, and statistical physics. Topics include: classical thermodynamics, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distributions. Three lecture hours per week.

PHYS 5181. Solid State Physics. (3) Cross-listed Course(s): PHYS 4181. Prerequisite(s): PHYS 3141 or permission of department. An introduction to solid-state physics. Topics include: crystal structures, reciprocal lattices, phonons, free electron Fermi gases, band structures, and electrical, magnetic, and optical properties of metals, semiconductors, and insulators.

PHYS 5222. Classical Mechanics II. (3) Prerequisite(s): PHYS 3121 and MATH 2241. Continuation of PHYS 3121. The second course of a two-semester sequence treating

particle dynamics, the motion of systems of particles, rigid body motion, moving coordinate systems, Lagrange's equations, Hamilton's equations, and small oscillations. Three lecture hours a week.

PHYS 5232. Electromagnetic Theory II. (3) Prerequisite(s): PHYS 4231. Continuation of PHYS 4231. The second course in a two-semester sequence. Topics include: magnetostatics in free space and in matter, electromagnetic induction, vector and scalar potentials, magnetic properties of materials, Maxwell's equations in free space and in matter, propagating electromagnetic waves, and boundary value problems. Three lecture hours a week.

PHYS 5242. Modern Physics II. (3) Prerequisite(s): PHYS 4241. An extension of PHYS 4241 to include more advanced topics such as generalized eigenvalue problems, angular momentum, spin, the hydrogen atom, and perturbation theory, with selected applications from atomic, solid state, and nuclear physics. Three lecture hours a week.

PHYS 5271. Waves and Optics. (3) Cross-listed Course(s): OPTI 5371. Prerequisite(s): PHYS 2102 with a grade of C or above, and MATH 2171; or permission of instructor. Topics include: the mathematics of wave motion, light as an example of an electromagnetic wave, the superposition of periodic and non-periodic waves, and selected topics from geometrical and physical optics.

PHYS 6000. Selected Topics in Physics. (0 to 4) Prerequisite(s): Permission of instructor. Selected advanced topics in physics. *May be repeated for credit with permission of department.*

PHYS 6108. Biophysics. (3) Prerequisite(s): Permission of instructor. Principles of physics relevant to biological media; electrical activity, optical microscopy, and spectrophotometry. Photosynthesis and light absorption. Models of blood flow and the cardiovascular system. Dynamics of membrane lipids and ionic flow. Visual and audio systems. Radiation biophysics, ultrasonic interaction in biological media. Credit cannot be awarded for both PHYS 6108 and 8101.

PHYS 6131. Classical Electromagnetism I. (3) Prerequisite(s): PHYS 4232. Electrostatic and boundary value problems. Multipole expansions, dielectrics and magnetostatics. Maxwell's equations, time varying fields and conservation laws. Plane electromagnetic waves and wave propagation. Wave guides and resonant cavities. Simple radiating systems. Scattering and diffraction theory.

PHYS 6140. Nuclear Physics. (3) Prerequisite(s): Permission of instructor. A study of the nucleus, radioactivity, nuclear

reactions, fission, fusion, interactions of radiation with matter and measurement of radiation.

PHYS 6141. Quantum Theory I. (3) Cross-listed Course(s): OPTI 6341 and OPTI 8341. Prerequisite(s): PHYS 4242. Principles of non-relativistic wave mechanics. The Schrodinger equation, linear harmonic oscillator and WKB approximation. Central forces and angular momentum. The hydrogen atom.

PHYS 6142. Quantum Theory II. (3) Prerequisite(s): PHYS 6141. Scattering theory, linear vector spaces, spin, two level systems. Quantum dynamics, symmetry operations, bound state and time-dependent perturbation theory. Theory of scattering, angular momentum, and identical particles.

PHYS 6181. Advanced Solid State Physics. (3) Cross-listed Course(s): ECGR 6132, ECGR 8132, OPTI 6371, and OPTI 8371. Prerequisite(s): Permission of instructor. Crystal structure. Electromagnetic, electron, mechanical, and elastic wave interactions with crystals. Theory of X-ray diffraction. Energy band theory of metals and semiconductors. Optical properties of solids, phase transitions, and amorphous solids. Quantum mechanics of covalent bonding, phonon excitation, and thermal energy.

PHYS 6202. Fundamentals of Biomedical Optics. (3) Cross-listed Course(s): OPTI 6202. Basic principles underlying tissue optics, laser-tissue interactions, and optical imaging, microscopy, and spectroscopy for medical applications.

PHYS 6204. Methods of Molecular Modeling and Simulation in Physics. (3) Prerequisite(s): Permission of instructor. Cross-listed Course(s): BINF 8311. Numerical methods. Atomic models of soft-matter systems: liquids, polymers, and biomolecules. Molecular dynamics and Monte Carlo methods. Inter-particle potentials. Methods of efficient conformational sampling. Free energy calculations. Introduction to fundamental methods of molecular simulations designed to characterize and predict properties of microscopic systems in materials, physics, and biology. Classical simulations and their connection to experimentally measurable properties. (*Spring, On demand*)

PHYS 6210. Theoretical Physics. (3) Prerequisite(s): Permission of department. Topics include: Matrices, power series, solutions to ordinary and partial differential equations, Hilbert space, Fourier integrals, boundary value problems, Green's functions, and complex analysis.

PHYS 6211. Introduction to Modern Optics. (3) Prerequisite(s): PHYS 4271 or permission of department. Theory of laser oscillation, optical resonators, interaction of radiation and atomic systems, giant pulsed lasers, laser systems. Wave propagation in nonlinear media, modulation of optical radiation, noise in optical detection

and generation. Interaction of light and sound. Laser types and applications including the free-electron laser.

PHYS 6220. Computational Methods in Physics. (3) Prerequisite(s): PHYS 6210. Use of computers in solving physics problems including computational and mathematical methods to solve problems in classical mechanics, quantum mechanics, electromagnetism, nuclear physics, optics, and solid state physics. Computer solutions include numerical methods of integration, solving differential equations, curve fitting, and statistical analysis in physics.

PHYS 6221 Optical Communications I. (3) Prerequisite(s): Prerequisite(s): PHYS 4242. Introduction to optical communications. Optical waveguides (attenuation, dispersions, etc.). Basic communication blocks such as lasers, optical modulators, and optical transceivers. Passive and active photonic components such as tunable lasers, optical amplifiers, SOAs, I-converters, and filters. Coherent and incoherent detection. Signal processing, photonic switching, and point-to-point connections. Three lecture hours per week.

PHYS 6251. Statistical Physics. (3) Prerequisite(s): Permission of instructor. Classical and quantum statistical mechanics. Statistical thermodynamics. Ensembles, partition functions, fluctuations, ideal Fermi and Bose gas systems.

PHYS 6281. Modern Optics Laboratory. (3) Prerequisite(s): PHYS 3281 or permission of instructor. Selected experiments in such modern optics areas as fiber optics, holography, spectroscopy, and Fourier optics. Six laboratory hours each week.

PHYS 6610. Biophysics Seminar. (1) The course is specifically designed to be relevant to PhD students in the Molecular Biophysics track and is an introduction to current topics in Molecular Biophysics. Students attend weekly seminars presented by researchers from within the University and across the world. *May be repeated for credit up to 1 credit hour. For non-doctoral students, the maximum number of repeats is up to 3 credits.*

PHYS 6991. Physics Thesis Research I. (1 to 3) Prerequisite(s): admission to candidacy and permission of instructor. Research for the thesis. Letter grade assigned. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit up to 6 credit hours.*

PHYS 6992. Physics Thesis Research II. (1 to 4) Prerequisite(s): PHYS 6991 and permission of instructor. Research for the thesis. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit up to 4 credit hours.*

Public Policy (PPOL)

PPOL 8000. Topics in Public Policy. (1 to 4) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Study of selected topics in Public Policy. *May be repeated for credit.*

PPOL 8101. Public Policy Studio I: Data Management and Basic Analytics. (3) Prerequisite(s): Admission to the Ph.D. in Public Policy or Graduate Certificate in Public Policy Research and Analysis. Hands-on data management and analysis skills through project-based learning. Students learn to formulate a data management plan and undertake the steps necessary to ensure that data is properly processed and analyzed. Students also learn how to interpret data and develop policy recommendations. This course prepares students for regression analysis so they clearly understand all steps that must be taken before running a regression, including proper conceptualization and operationalization of variables.

PPOL 8102. Public Policy Studio II: Applied Research and Regression Analysis. (3) Prerequisite(s): GRAD 8101; PPOL 8101; and admission to the Ph.D. in Public Policy or Graduate Certificate in Public Policy Research and Analysis. Provides hands-on research experience through project-based learning. Students conduct guided independent research. They also conduct a literature review to develop research questions and hypotheses; identify a secondary dataset that is appropriate for testing their hypotheses; employ the R statistical software package to manage the entire research process for secondary data analysis; interpret regression analysis; and develop policy recommendations. Each step in the process is completed in the classroom where faculty can work with students. Gaps in knowledge are addressed through short lectures, as necessary.

PPOL 8600. Policy Process I. (3) Prerequisite(s): Prior coursework or experience relevant to political and legal processes, behaviors, and institutions. This is a Core Course in the Ph.D. in Public Policy program. Examination of the field of public policy analysis to include both theory and practice. Process includes everything from sources of public problems to feedback mechanisms after policy implementation. Emphasis on the policy process in growing urban regions and the ability to communicate with stakeholders to determine value conflicts and to communicate policy solutions. Examination of the context (legal, institutional, historical, philosophical, social, political, physical and spatial) within which policy is made with sensitivity to gender, race and ethnicity, and class concerns.

PPOL 8602. Research Design in Public Policy. (3) This is a Core Course in the Ph.D. in Public Policy program. Introduces students to various quantitative and qualitative approaches to doing policy research. Considers such major issues in philosophy of science as causality, measurement, and post-positive approaches to research. Students may use the course to prepare their dissertation proposals or research grant and contract proposals.

PPOL 8610. The Urban Region. (3) Cross-listed Course(s): GEOG 6123 and GEOG 8123. Prerequisite(s): Prior coursework or experience relevant to the nature of urban regions. Examination of the nature of urban regions. The basic factors that shape urban regions as they grow. Impact of: geography; history; social factors; economic factors; concerns about gender, race and ethnicity, and class; and other determinants of the nature of urban regions, their problems, and possible policy solutions.

PPOL 8611. Metropolitan Governance and Administration. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Introduction of major issues in urban politics and related trends and problems in urban governance and administration.

PPOL 8612. Theory of Urban Development. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Analysis of urban economics and politics within the context of public policy and planning. Focuses on theory and application to understand the rationale for and effects of urban policy, urban economic development, and planning. Provides basic understanding of the operation of urban real estate markets and the motivation for public sector interventions. Applies theoretical foundations to the study of current urban problems and controversies. Familiarity with introductory microeconomics is required.

PPOL 8613. Transportation Policy. (3) Cross-listed Course(s): GEOG 6600 and GEOG 8600. Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examines surface transportation from a broad public policy perspective with a special focus on its institutional components and the changing role of government in transportation policy-making including the evolution of, and relationships among, various federal, state and local policies that affect investment decisions in transportation infrastructure.

PPOL 8614. Colloquium in 20th Century Black Urban History. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examination of major and topical monographic works in African American urban history during the twentieth century. The focus will be on such topics as" classical urban examinations by black scholars, ghettoization and

alternative theories, community and its institutions, riot and urban rebellions, biography, black mayors, and urban policy.

PPOL 8615. The Restructuring City. (3) Cross-listed Course(s): GEOG 6210 and GEOG 8210. Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. This course places at center stage the causes and consequences of contemporary urban restructuring and evaluates the theoretical, planning, and policy challenges inevitably presented.

PPOL 8616. Urban Planning Theory and Practice. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Alternative planning theories and application of theories in urban planning practices.

PPOL 8617. Law and Management. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Constitutional and administrative law issues, including a survey of academic debates over contested issues, and selected areas in constitutional law on civil liberties and civil rights.

PPOL 8622. Qualitative Methods in Public Policy. (3) Advanced qualitative methods as applied to analysis and solution of public problems. Use of qualitative methods to analyze public problems; to devise appropriate, effective, acceptable public policies; to evaluate public programs; and to present the results of qualitative analysis to appropriate audiences.

PPOL 8625. Advanced Seminar in Spatial Decisions Support Systems. (3) Prerequisite(s): GEOG 5120 or permission of instructor. Theoretical aspects of spatial DSS including technical, social, political and psychological considerations; system s design; systems manipulation; and case studies. Three hours of lecture and one-two hour lab per week.

PPOL 8630. Advanced Program Evaluation. (3) This is a CORE course in the Ph.D. in Public Policy program. Development and application of policy analysis to the evaluation of existing public policies. Particular attention to the use of multiple techniques of analysis and presentation of program evaluations to relevant audiences.

PPOL 8635. Ethics of Public Policy. (3) This is a CORE course in the Ph.D. in Public Policy program. Ethical questions in the study, formation, implementation, and evaluation of public policies. Ethical dilemmas faced by the public policy analyst, and the importance of use of values analysis. Emphasis on understanding how values are communicated by a variety of stakeholders in policy systems and how communicating public policy solutions

involves an understanding of the role of values in successful policy formation and implementation.

PPOL 8636. The Social Context of Mental Health. (3) Cross-listed Course(s): SOCY 6635, SOWK 6635, and PSYC 8636. Prerequisite(s): Admission to graduate program or permission of instructor. Draws upon contributions from the field of psychiatry, psychology, social work, and anthropology. Focuses on mental health and illness it is social context, with an emphasis on the relationship between social structure and mental health/disorder. Examines the social factors which shape psychiatric diagnosis, the effects of socio-demographic variables on mental health, and the role of social support and stress for different groups. Also examines the organization, delivery, and evaluation of mental health services, and mental healthcare policy.

PPOL 8640. Economic Analysis of Public Policy I. (3) This is a CORE course in the Ph.D. in Public Policy program. Economic role of government, efficiency versus equity, externalities, and public goods, market failures and government failures, economics of centralized versus decentralized decision making, public choice theory, economics of privatization, economic role of nonprofits and non-governmental organizations.

PPOL 8641. Economic Analysis of Public Policy II. (3) Prerequisite(s): PPOL 8640. This is a CORE course in the Ph.D. in Public Policy program. Economics of taxation and government borrowing, benefit-cost analysis, regional growth and development, econometric analysis of local and regional public policy issues.

PPOL 8642. Regional Economic Development. (3) Cross-listed Course(s): GEOG 6302 and GEOG 8302. Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program; PPOL 8610; intermediate microeconomics; or permission of instructor. Course covers classical, neo-classical and contemporary theories of trade, economic geography, and regional development. Topics include: theories of urban and regional growth, location theories, human capital, labor force and entrepreneurial contributions to growth. Policy dimensions of urban growth and development are addressed from theoretical and empirical perspectives.

PPOL 8644. Public Budgeting and Financing. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Focus is on the public budget process as a means of policy development, analysis and implementation. It will also address in more depth issues of financing the policies authorized in the budget and for which appropriations are sought.

PPOL 8650. Environmental Policy. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or

permission of instructor. This course draws upon concepts and tools from economics, geography, law, sociology, political science, and planning to explore the concept of sustainable development, a central tenet of environmental policy. Environmental policy will be analyzed within the federalist framework.

PPOL 8652. Energy and Environmental Economics. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Economics issues of both energy and environment. Energy issues include the historical development of energy resources, supply and demand considerations, and projections of the future energy balance. Environmental issues are externalities, common property resources, and government regulation. Policy considerations include environmental standards, pollution charges, and property rights. Cost-benefit analysis and microeconomic theory are applied.

PPOL 8653. Urban Air Quality. (3) Prerequisite(s): Ph.D. student and permission of instructor. Examination of the relationships between climatic processes and urban air quality with emphasis on trends and patterns. Topics will include health and environmental effects of air pollution, ozone climatology, pollutant transport, transportation related emissions, risk assessment, and air quality management.

PPOL 8661. Social Organization of Healthcare. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Focuses on the structures and operations of healthcare institutions and providers. The topics covered include the socio-historical development of the existing healthcare system, healthcare occupations and professions, professional power and autonomy, professional socialization, inter-professional and provider-client relations, healthcare organizations, and how change affects the delivery of healthcare services.

PPOL 8663. Health Policy. (3) Cross-listed Course(s): HSRD 8204. Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program and a graduate level course providing an adequate introduction to the U.S. healthcare system such as HADM 6100 or permission of instructor. Examines the formulation, adoption, implementation, and evaluation of health policy at national, state, and local levels through extensive readings in relevant health and policy literatures.

PPOL 8665. Analytic Epidemiology. (3) Cross-listed Course(s): HLTH 6260. Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program; and HADM 6104 or permission of instructor. Practical experience in preparing, analyzing, and presenting findings from epidemiologic data in the form of a research report or a manuscript. Students critically examine different

epidemiologic research designs, identify sources of error, and develop skills to use bivariate and multivariate approaches to analyze epidemiologic associations. Students are also introduced to sources of secondary datasets and use statistical software such as STATA, SAS to perform data analysis.

PPOL 8667. Economic of Health and Healthcare. (3) Cross-listed Course(s): ECON 6260 and HSRD 8203.

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program, PPOL 8640 and PPOL 8641 or permission of instructor. Uses economic theory and econometrics to analyze the functioning of the healthcare sector and appropriate public policy. Topics include: how markets for medical care differs from other markets, the demand for medical care, the demand and supply of health insurance, the role of competition in medical markets, managed care, managed competition, and the role of the public sector in regulating and financing healthcare.

PPOL 8669. Investigating Health and Health Services. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program, GRAD 8101, and GRAD 8103; or permission of instructor. How to conduct and evaluate research necessary to health policy. Students are expected to conduct research utilizing a variety of methodologies and learn how to access available secondary data sets relevant to healthcare and policy. Topics include: multidisciplinary collaboration, measurement of health related constructs and healthcare outcomes, and health evaluation (cost, quality, access). Students are expected to develop their dissertation proposals as one outcomes of this course. Designed to be a seminar, and active participation in class discussion and activities is essential.

PPOL 8671. Criminal Justice Policy. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examination of the criminal justice subsystems (law enforcement, courts, corrections) with particular focus on the development of policy and the effectiveness of current policies aimed at reducing crime.

PPOL 8672. Theories of Crime and Justice. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Exposes students to mainstream and critical theoretical approaches to crime, justice, and criminal behavior. An emphasis on both broad conceptual orientations allows us to assess the development of criminology within an array of historical and philosophical contexts during the past three centuries.

PPOL 8673. Law and Social Control. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examines how the criminal law functions as a powerful tool of social control in our society. Particular emphasis is given to understanding the

constitutional limitations placed on construction of law, the elements of criminal offenses, and criminal defenses.

PPOL 8681. Race, Gender, Class, and Public Policy. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. An overview of major theories, trends, and debates on the topic of gender, race and economic inequality in the contemporary United States.

PPOL 8682. Stratification and Social Policy. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examines: (a) structures and processes underlying social stratification in the United States, particularly the inequality that is grounded in social class, gender, ethnicity, and race; and (b) the social policy implications that follow from our analysis of the nature and sources of stratification.

PPOL 8683. Population Dynamics and Social Policy. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Basic population characteristics, such as age distribution, life expectancy, fertility, and trends in these characteristics are relevant to nearly all social policy. An introduction to basic concepts and tools of demographic analysis and how they may be applied to the study of social policy including family policy, aging policy, and minority groups' policy.

PPOL 8685. Aging and Social Policy. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Utilizes the concepts of social gerontology as a Springboard for examining social policy for an aging population. Examination of the public policy making process with attention to aging policy. Consideration of determinants of aging policy and institution and actors in the policy making process and piecemeal development of legislation analyzed as factors related to the making of policy for the aged.

PPOL 8687. Education Policy. (3) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examines equity, efficiency, and diversity tradeoffs among alternatives systems of delivering K-12 education. The course also examines how to evaluate educational policies and programs.

PPOL 8688. Political Economy of School Reform. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examines between business leaders' vision for school reform and the school restructuring movement, the reforms which arise from their construction of the problem, local educational restructuring efforts within the context of the larger national reform movement, and the opportunities and dangers of corporate-inspired educational policies.

PPOL 8689. The Social Context of Schooling. (3)

Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. Examines the relationships among certain aspects of the contemporary social structure and educational processes and outcomes. It explores the ways that the social class structure, race, and gender stratification affect the ways individuals experience, understand, and acquire education.

PPOL 8690. Seminar in Public Policy. (1) Prerequisite(s): Full graduate standing in the Ph.D. in Public Policy program or permission of instructor. This is a CORE course in the Ph.D. in Public Policy program. Series of guest speakers and exercises on a range of policy issues. Designed to increase familiarity with the variety of topics and methods covered by policy making and analysis as well as career options. Student participation and oral critique of a selected speaker and their topic. *Must be repeated for credit for a total of 3 credits.*

PPOL 8701. Advanced Macroeconomic Theory. (3) Cross-listed Course(s): ECON 6201. Prerequisite(s): Admission to graduate program and permission of program director. Theories of aggregate income determination, inflation, unemployment, interest rates and economic growth; macro-economic consumption and investment behavior; the business cycle.

PPOL 8703. Advanced Microeconomic Theory. (3) Cross-listed Course(s): ECON 6202. Prerequisite(s): Admission to graduate program and permission of program director. Theories of the firm, of the consumer, and of resource owners; determination of prices under different market structures; general equilibrium analysis and welfare economics.

PPOL 8705. Advanced Urban and Regional Economics. (3) Cross-listed Course(s): ECON 6250. Prerequisite(s): Admission to graduate program. Applications of microeconomic theory to problems of cities, metropolitan areas and regions; methods in regional analysis, location theory, land use planning, measurement of economic activity; transportation, housing, poverty, and growth issues.

PPOL 8707. Game Theory and Experiments. (3) Cross-listed Course(s): ECON 5161. Prerequisite(s): Permission of the Graduate Program Director. Focuses on game theoretic analysis and the experimental methodology which can be used to test game theoretic models. The primary topics in game theory include: static games with complete information, dynamic games with complete information, static games with incomplete information, and dynamic games with incomplete information. Some topics are introduced by way of an economic experiment, and the experiment is followed by a rigorous analysis of the game theoretic solution to the game. The latter part of the

course focuses on how to design economic experiments as a means of testing the predictions of game theoretic models.

PPOL 8709. Public Economics. (3) Cross-listed Course(s): ECON 6256. Prerequisite(s): MATH 1241 or equivalent, and permission of the program director. Public economics is the study of the way governments choose spending, taxation, and regulatory policy; the ways such policies may affect economic welfare; and mechanisms to evaluate the economic effects of such policies.

PPOL 8711. Monetary and Financial Theory. (3) Cross-listed Course(s): ECON 6235. Prerequisite(s): ECON 6201 or ECON 6202; and ECON 6112 or equivalent. Theory and empirical tests of money supply, money demand, and financial markets; portfolio theory with special attention to portfolio choices of banks; term structure of interest rates; dynamic models of money and economic activity.

PPOL 8800. Independent Study. (1 to 3) Prerequisite(s): Permission of instructor and the program director. Supervised study of a public policy topic or problem of special interest to the student and within the instructor's expertise. *May be repeated for credit.*

PPOL 8801. Dissertation. (1 to 9) Prerequisite(s): Passage of qualifying examinations, and approval of dissertation topic by the student's advisory committee. In-depth study of a practical problem in public policy. Analysis of the problem, preparation of a policy solution, and presentation of the solution to appropriate stakeholders and the public. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit up to 18 credit hours.*

PPOL 8802. Independent Study II: Public Policy Research Experience. (3) Prerequisite(s): Permission of instructor and department to be obtained in the semester preceding the semester in which the course is to be taken. Guided research with a faculty mentor. Students gain hands-on research experience and may participate in research at the University or in the broader community under the guidance of a faculty mentor. *May be repeated for credit up to 6 credit hours.*

Psychology (PSYC)

PSYC 5001. Advanced Topics in Psychology. (3) A discussion of selected topics in psychology. *May be repeated for credit with change of topic.*

PSYC 5316. Cognitive Neuroscience. (3) Prerequisite(s): graduate standing or permission of instructor. Biological basis of consciousness and the neurobiology of mental processes by which we perceive, act, learn, and

remember; representation of mental processes from electrophysiological and brain imaging techniques, clinical neurology, and computational science.

PSYC 6015. Topics in Perception and Physiological Psychology. (3) An examination of selected topics in the areas of sensation and perception, physiological and neuropsychology, with an emphasis on the applications to the areas of clinical, community, and industrial psychology. *May be repeated for credit with permission of department.*

PSYC 6030. Topics in Social Psychology and Personality. (3) An examination of selected topics in personality and social psychology, with an emphasis on the applications to the areas of clinical, community, and industrial psychology. *May be repeated for credit with permission of department.*

PSYC 6050. Topics in Psychological Treatment. (3) Cross-listed Course(s): HPSY 8050. Prerequisite(s): PSYC 6151. A topical course which will focus on issues in treatment, alternative treatment perspectives, special client populations. *May be repeated for credit with permission of department.*

PSYC 6099. Topics in Psychology. (3) Cross-listed Course(s): HPSY 8099. A discussion of selected topics in psychology. *May be repeated for credit with change of topic.*

PSYC 6102. Organizational Research Methods. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Research design and the application of statistical methods to I/O research, with a specific focus on gathering and evaluating organizational data.

PSYC 6107. Ethical and Professional Issues in Psychology. (3) Cross-listed Course(s): HPSY 8107. Roles and responsibilities of psychologists, including ethical standards in professional practice, testing and research; expectations and problems confronting psychologists in industrial, clinical and professional organizations.

PSYC 6113. Physiological Psychology. (3) The relationships between the nervous system and behavior. Topics include: the structure of the nervous system and nerve conduction, the functional organization of the central nervous system, neuronal and hormonal control of behavior, biofeedback and other appropriate topics.

PSYC 6115. Sensation and Perception. (3) Processes involved in receiving and interpreting sensory data including all the sensory systems with an emphasis on vision.

PSYC 6116. Cognition. (3) Concerned with how humans acquire information, retain information in memory, and use this information to reason and solve problems. Current emphases include memory, category learning, planning, concept formation, problem solving, mental models, and knowledge representation.

PSYC 6124. Psychology of Aging. (3) Cross-listed Course(s): GRNT 6124. Psychology of aging with particular emphasis on issues related to community/clinical psychology and industrial/organizational psychology. Topics include: myths and stereotypes about aging, problems faced by older workers, retirement, mental health and normal aging, counseling the older adult, and psychological disorders in later life.

PSYC 6130. Social Psychology. (3) Cross-listed Course(s): OSCI 8130. Human social behavior; topics include affiliation, person perception, conformity and attitudes.

PSYC 6141. Intellectual Assessment. (4) Cross-listed Course(s): HPSY 8141. Theories of intelligence and methods of intellectual assessment, including practice in administering intelligence tests, interpreting results, and writing evaluation reports. Three lecture hours and one two-hour lab per week.

PSYC 6142. Personality Assessment. (4) Cross-listed Course(s): HPSY 8142. Prerequisite(s): PSYC 6151, PSYC 6141, or permission of department. Theories and methods used in the assessment of personality and psychopathology, including practice in administering personality tests, interpreting results and writing evaluation reports. Three lecture hours and one two-hour lab per week.

PSYC 6145. Applied Research Design and Program Evaluation. (3) Cross-listed Course(s): HPSY 8145. Prerequisite(s): PSYC 6102. Models of evaluative research; also techniques, designs and administration of program evaluation. Topics include: role conflicts, entry issues, goal setting, research for program planning and implementation and examples of actual program design and evaluation.

PSYC 6150. Introduction to Psychological Treatment. (4) Cross-listed Course(s): HPSY 8150. Prerequisite(s): PSYC 6151. Major approaches to psychological intervention, including psychodynamic, behavioral, humanistic and cognitive-behavioral systems. Emphasis on practical therapy considerations, including crisis intervention, client behaviors at various stages of therapy, handling difficult clients and ethical and professional issues. Three lecture hours and one two-hour lab per week.

PSYC 6151. Behavior Disorders. (4) Cross-listed Course(s): HPSY 8151. Diagnostic systems in current use and the implications of these systems for psychologists; several

perspectives on psychological processes, behavior disorders and diagnosis including psychodynamic, behavioral and social models; practice in diagnostic interviewing. Three lecture hours and one two-hour lab per week.

PSYC 6155. Community Psychology. (3) Cross-listed Course(s): HPSY 8155. Research, intervention techniques and settings associated with major approaches in community psychology including the mental health, organizational, ecological, and social action models.

PSYC 6171. Industrial/Organizational Psychology. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Human behavior within organizations. Topics include: recruitment, hiring, competency modeling, talent management, leadership, job attitudes, and organizational development and change.

PSYC 6172. Talent Acquisition. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Issues associated with the attraction and evaluation of job applicants. Topics include: job analysis, testing in industry, interviews, personality measures, assessment centers, and managing the hiring process.

PSYC 6173. Job Attitudes. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. The individual within the organization, including job attitudes, engagement, and motivation.

PSYC 6174. Organizational Dynamics. (3) Prerequisite(s): PSYC 6171. Group processes, including group formation, group decision-making, leadership, and group structure.

PSYC 6175. Organizational Development and Change. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Organization theories and organizational change methods.

PSYC 6177. Talent Management. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Theoretical bases of talent management. Topics include: performance appraisal, legal issues, succession planning, human resource planning, and training and development.

PSYC 6200. Health Psychology I. (3) Cross-listed Course(s): HPSY 8200. Intensive review of the contributions of the discipline of psychology to the promotion and maintenance of health, the prevention and treatment of illness, and the improvement of the healthcare system. Examines links between psychology and health by

emphasizing interactions among biological, behavioral and social systems that impact health and illness experiences. Topics include: stress, coping, pain, chronic disease and psychoneuroimmunology. Emphasizes the relevance of age, gender, personality, and culture for understanding health-related behaviors.

PSYC 6205. Field and Lab Based Quantitative Research Methods. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Examines quantitative approaches to Organizational Science research such as experimental designs, quasi-experimental designs, organizational surveys, longitudinal models and field research.

PSYC 6207. Measurement in Organizations. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Presents an introduction to classical and modern test theory and methods. Topics include: Classical True Score Theory, reliability and validity inferences, and an introduction to factor analysis. Special emphasis is given to evaluating the quality of existing tests and assessments.

PSYC 6216. Introduction to Cognitive Science. (3) Cross-listed Course(s): ITCS 6216 and ITIS 6216. This course presents multiple perspectives on the study of intelligent systems. Broad coverage of such topics as philosophy of mind; human memory processes; reasoning and problem solving; artificial intelligence; language processing (human and machine); neural structures and processes; and vision. Also included is participation in the cognitive science seminar.

PSYC 6255. Community Interventions. (3) Cross-listed Course(s): HPSY 8255. Prerequisite(s): PSYC 6155 or HPSY 8155. Intensive review of the use of system- and organizational-level interventions to promote and maintain health, prevent illness, and improve quality of life. Presents an historical overview of the effectiveness of different types of interventions, and theoretical and empirical background regarding the conditions and factors that contribute to successful community interventions. Students develop and implement a community intervention, in collaboration with a local organization, and develop a grant proposal that would fund a community intervention.

PSYC 6261. Independent Study in Health Psychology. (1 to 3) Prerequisite(s): PSYC 6200. Directed individual study of an issue in health psychology arranged with a faculty member. *May be repeated for credit.*

PSYC 6450. Practicum in Clinical Psychology. (1 to 3) Cross-listed Course(s): HPSY 8450. Prerequisite(s): PSYC

6150 and permission of department. Experience in clinical assessment and/or psychotherapy with clients at local agencies under supervision from a faculty member on campus. *May be repeated for credit with permission of department.*

PSYC 6455. Practicum in Community Psychology. (1 to 3) Cross-listed Course(s): HPSY 8455. Applications of the principles of community psychology to special problems within an organization or community setting. The project might include, but would not be limited to, consultation, program development, training, community education or program evaluation. *May be repeated for credit with permission of department.*

PSYC 6617. Computational Human Behavior Modeling. (3) Cross-listed Course(s): ITCS 6617. Computational human behavior modeling is a research area at the intersection of computer science and social science, including psychology, sociology, communication, and linguistics. Its objective is to advance both fields by combining the power of data analytics and artificial intelligence with the scientific method for studying human data and human behavior. This course is a research seminar in which students engage with research through a series of readings, understanding concepts in the social sciences about human language, attitudes, and behaviors and understand how these concepts can be formalized into computational models or algorithms.

PSYC 6630. Topics in Talent Management. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Examination of special topic(s) germane to talent management. The seminar may focus on one or a small number of topics salient to this area. *May be repeated for credit with change of topic.*

PSYC 6640. Topics in Organizational Psychology. (3) Prerequisite(s): Enrollment in M.A. in Industrial/Organizational Psychology program, and permission of department or instructor. Examination of special topic(s) germane to organizational psychology. The seminar may focus on one or a small number of topics salient to this area. *May be repeated for credit with change of topic.*

PSYC 6650. Research Methods Seminar in Organizational Science. (3) Cross-listed Course(s): OSCI 8650. Prerequisite(s): Full graduate standing in a psychology graduate program or permission of instructor. Examination of special topic(s) germane to research methods in Organizational Science. The seminar may focus on one or a small number of topics that define this area (e.g., a data analytic technique, a methodological approach). Extensive

reading and discussion of topics from multiple perspectives. *May be repeated for credit.*

PSYC 6899. Readings and Research in Psychology. (1 to 4)

Cross-listed Course(s): HPSY 8899. Prerequisite(s): Permission of instructor and department to be obtained in the semester preceding the semester in which the course is to be taken. Individual study in psychology which may take the form of conducting empirical research or formulating a critique and synthesis of existing research. *May be repeated for credit.*

PSYC 6999. Thesis. (1 to 3) The thesis is coordinated with the student's interests and practical experience during the second year to allow the development of an area of specialization. Thesis projects can be of three types: an original experiment that will contribute to the psychological literature; a thorough case analysis including literature review and application; the development of a community psychology program or intervention to accomplish an important, well-defined goal. A completed paper and oral presentation are required. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit with permission of department.*

PSYC 8203. Research Seminar. (1) Prerequisite(s): Admission to the Health Psychology Ph.D. Program. A seminar course introducing students to health psychology research in the university. Topics include: a discussion of specific ongoing health psychology research, IRB procedures, presenting data at professional conferences, and submission of journal articles and research grants. The course must be taken once in the fall and once in the spring of the student's first full year in the Ph.D. program in Health Psychology. *May be repeated for credit one time.*

PSYC 8222. Teaching of Psychology. (3) Prerequisite(s): Admission to the Ph.D. program in Health Psychology and permission of instructor. Strategies for, and issues related to, teaching undergraduate courses in psychology as part of a general undergraduate education.

PSYC 8355. Community Research Practicum. (3) Prerequisite(s): HPSY 8155 and doctoral student standing. Methods for conducting applied community research. Students develop and implement applied research project.

PSYC 8422. Advanced Practicum in the Teaching of Psychology. (1 to 3) Prerequisite(s): PSYC 8222 and permission of graduate program director. The advanced training and supervision in the teaching of psychology course feature application of the principles of good teaching in psychology to address problems encountered in the classroom and to suggest opportunities for greater effectiveness. Readings from professional journals, discussion, and practical application in the classroom,

including instructor observation, are used to meet course objectives. May be repeated for credit with department approval.

PSYC 8636. The Social Context of Mental Health. (3)

Cross-listed Course(s): SOCY 6635, SOWK 6635, and PPOL 8636. Prerequisite(s): Admission to a graduate program or permission of instructor. Draws upon contributions from the field of psychiatry, psychology, social work, and anthropology. Focuses on mental health and illness in its social context, with an emphasis on the relationship between social structure and mental health/disorder. Examines the social factors which shape psychiatric diagnosis, the effects of socio-demographic variables on mental health, and the role of social support and stress for different groups. Also examines the organization, delivery, and evaluation of mental health services, and mental healthcare policy.

Reading, Language, and Literacy (READ)

READ 5000. Topics in Reading, Language, and Literacy. (1 to 6) May include classroom and/or clinical experiences in the content areas. *May be repeated for credit with change of topic and permission of department.*

READ 5111. Essentials of Literacy Instruction. (2-3)

Prerequisite(s): Admission to Graduate Certificate in Elementary Education program. Corequisite(s): ELED 5110 and ELED 5112L. Research, theory, and instructional practice related to the reading process and reading instruction in the elementary school with a focus on the essential components of literacy: concepts about print, phonological awareness and phonemic awareness, phonics, fluency, vocabulary, comprehension, and writing. Emphasis is placed on instruction. Includes an extensive field-based component.

READ 5200. Early Literacy and Assessment. (3)

Prerequisite(s): ELED 5101. Research, theory, and instructional practice related to the reading process and reading instruction in the elementary school with a focus on emergent reading behaviors; phonics and phonemic awareness; balanced literacy; assessment-based instruction; and meeting the needs of diverse learners. Includes an extensive field-based component (approximately 20 hours).

READ 5211. Methods of Literacy. (2-3) Prerequisite(s): ELED 5110, ELED 5112L, and READ 5111. Corequisite(s): ELED 5212L.

Research, theory, and instructional practice related to the reading process and reading instruction in the elementary school with a focus on essential literacy practices, explicit teaching, integrating the communication processes with all

subject areas, comprehension, authentic assessment-based instruction, addressing the needs of diverse and struggling readers, and small group and whole class reading instructional practices. Includes an extensive field-based component.

READ 5255. Integrating Reading and Writing in the Content Areas. (3) Critical role of reading in learning course content in almost every subject area in the curriculum. Further, it is often the vehicle for assessing students across subjects. Methods for helping students become better readers. Extensive clinical experience required.

READ 5300. Applied Literacy Practices. (3) Prerequisite(s): READ 5200. Research, theory, and instructional practice related to integrating the communication processes with all subject areas with a focus on vocabulary, comprehension, study skills, addressing the needs of diverse and struggling readers, and instructional approaches in a reading classroom. Includes an extensive, field-based component (20 hours of clinical experiences are required).

READ 5311. Literacy Assessment and Tiered Interventions. (2-3) Prerequisite(s): ELED 5112L, ELED 5210, ELED 5212L, and READ 5211. Corequisite(s): ELED 5312L. Understand and use a variety of evidence-based reading assessments to diagnose areas of difficulty in reading or reading abilities/deficiencies; track and predict student progress; plan and implement appropriate instruction, supports, and interventions to meet the needs of all students; and determine the effectiveness of instructional practices. Includes an extensive field-based component.

READ 6000. Topics in Reading, Language, and Literacy. (1 to 6) Cross-listed Course(s): EDCI 8040. May include classroom and/or clinic experiences in the content areas. *May be repeated for credit with permission of department.*

READ 6100. Trends and Issues in Literacy and Leadership. (3) Cross-listed Course(s): EDCI 8140. Theories, research, and current issues associated with literacy, preschool through high school. Students explore current scholarship related to early literacy, adolescent literacy, reading instruction and assessment, family literacy, literacy coaching, and digital literacies, as well as other current literacy issues.

READ 6204. Teaching Reading to English Language Learners (3) Research, theory, and instructional practices related to the reading process and reading instruction for English Language Learners in K-12 classrooms; relationship between language development and reading; examination of instructional materials; and field-based application of course content.

READ 6250. Emergent and Elementary Literacy. (3) Cross-listed Course(s): EDCI 8250. Prerequisite(s): Completion of Phase I. Critical reading and use of the literature in literacy education, examination of literacy content taught in the K-6 curriculum with an emphasis on pre-K and beginning reading instruction research, theory and practice, multiple models and approaches for teaching and assessing learning in literacy development, required action research project.

READ 6252. K-12 Writing Development and Instruction. (3) Cross-listed Course(s): EDCI 8252. Theories, research, and critical issues related to students' writing development and effective writing instruction. Field experience required.

READ 6254. Collaborative Leadership in Literacy Education. (3) Cross-listed Course(s): EDCI 8254. Prerequisite(s): Completion of Phases I, II, and III. Investigates models and strategies for assuming the leadership responsibilities of a literacy specialist, including mentoring, staff development, school-wide literacy program development and assessment, supporting the action research of teachers, and developing partnerships with parents and community volunteers.

READ 6255. Middle/Secondary Reading and Writing. (3) Cross-listed Course(s): EDCI 8255. Prerequisite(s): Completion of Phase I. Theories, research, and instructional methods associated with reading and writing in the content areas, with a special emphasis on grades 6-12. Field experience and action research project are required.

READ 6260. Diagnostic Assessment and Instruction in Reading. (3) Cross-listed Course(s): EDCI 8256. Prerequisite(s): Completion of Phases I and II. Examination, uses, and critique of theories and research about literacy processes and problems; diagnosis and correction of reading disabilities; instructional strategies designed to improve reading proficiency.

READ 6265. Multiliteracies in a Global World: Reading and Writing Texts in New Times. (3) Cross-listed Course(s): EDCI 8265. Immerses students in both the theory and practice of multiliteracies and considers how globalization has created a more complex environment for teachers and students. Focus goes beyond traditional print-based literacy to multiple forms of knowing, including print, images, video, combinations of forms in digital contexts, which are represented in inter-related and complex ways.

READ 6300. Global Literacy: Genre Study. (3) Examines various genres and texts that provide a global perspective of literacy, and considers methods for incorporating these genres and texts into the K-12 classroom.

READ 6800. Individual Study in Reading, Language, and Literacy. (1 to 6) Cross-listed Course(s): EDCI 8840. Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

Religious Studies (RELS)

RELS 5000. Topics in Religious Studies. (3) Prerequisite(s): Permission of instructor. Major topics in religious studies. *May be repeated for credit.*

RELS 5010. Major Figure in Religious Studies. (3) The life and works of a major figure who has contributed to religious studies. *May be repeated for credit with change of figure.*

RELS 5101. Religion and Modern Thought. (3) The interaction of modern thought and modern religious sensibilities.

RELS 5107. Early Judaism. (3) Comparative historical and literary study of the varieties of Judaism evidenced during late antiquity (circa 70-640 C.E.), with special attention devoted to the formation and development of rabbinic Judaism.

RELS 5109. Modern Judaism. (3) Historical and conceptual study of Judaism and Jewish experience in Europe, America, and Israel, from the 16th century to the present, with special attention paid to the development of denominations, Zionism, and the Holocaust.

RELS 6000. Topics in Religious Studies. (3) Prerequisite(s): Permission of instructor. Major topics in religious studies. *May be repeated for credit.*

RELS 6101. Approaches to the Study of Religion. (3) Prerequisite(s): Permission of department. Provides students with critical tools for research, analytical thinking, and writing in the academic study of religion. The topics and individuals this course covers represent several major currents of thought in the field of religious studies.

RELS 6102. Teaching in the Humanities. (3) Prerequisite(s): Permission of department. Approaches the academic study of religion through the lens of its particular pedagogical challenges and rewards. Explores the history of religious studies in American classrooms, and surveys the scholarship of teaching and learning. Examination of a range of pedagogical philosophies where students may articulate their own vision of teaching. Students also have an opportunity to develop teaching portfolios, syllabi, and to create meaningful assignments.

RELS 6615. Seminar in the Religions of Late Antiquity. (3) Prerequisite(s): Permission of department. Current and seminal issues related to the academic study of one or more of the religions practiced in the Roman and/or Sasanian Empires during late antiquity. A general theme must be chosen that may center upon one or more specific religious identities or trajectories; one or more textual traditions; an influential figure or interpretive school; or a topical investigation. *May be repeated for credit with change of topic.*

RELS 6622. Seminar in Religion and Modern Culture. (3) Prerequisite(s): Permission of department. A seminar on issues related to the historical-critical study of the interaction between religion and modern culture. One or more general themes will be chosen: leading theorists, appropriate historical contexts, global contexts, or a topical investigation. *May be repeated with change of topic.*

RELS 6641. Seminar in Asian Religions. (3) Prerequisite(s): Permission of department. Current and seminal issues related to the academic study of one or more of the religions of South and/or East Asia. A general theme must be chosen that may center upon one or more specific religious traditions; an important individual figure or character; one or more textual sources or literary genres; an historical period or epoch; or a topical investigation. *May be repeated for credit with change of topic.*

RELS 6671. Seminar in Theory and Methods. (3) Prerequisite(s): Permission of department. Current and seminal issues related to contemporary theory and cultural studies and their import for the academic study of religion(s). A general theme must be chosen that may center one or more specific theories or methods; an influential thinker or school of thought; an historical period or cultural movement; or a topical investigation. *May be repeated for credit with change of topic.*

RELS 6800. Directed Readings/Research. (1 to 3) Prerequisite(s): Prior written permission of instructor. Investigation of a topic in religious studies culminating in a research paper. *May be repeated for credit with change of topic.*

RELS 6999. Thesis. (3 or 6) The thesis is coordinated with the student's interests and practical experience to allow the development of an area of specialization. Appropriate research and written exposition of that research is required. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit with permission of department, if taken for 3 credit hours. Six credit hours of Thesis may be taken during a single semester.*

Respiratory Care (RESP)

RESP 5101. Health Outcomes and Quality Assessment. (3) Cross-listed Course(s): RESP 4101. Prerequisite(s): RESP 6101 or permission of instructor. An overview of the U.S. healthcare system and healthcare organizational structure. Emphasis placed on developing knowledge and skills using evidence-based methods and techniques to design, implement, and evaluate healthcare quality control/improvement and patient safety initiatives.

RESP 5102. Department Management in the Healthcare Environment. (3) Cross-listed Course(s): RESP 4102. Prerequisite(s): RESP 5101 and RESP 6101. Provides an understanding of the administrative and financial aspects of healthcare management, introducing concepts related to strategic planning and healthcare marketing. Students learn about financing healthcare and health insurance, as well as managing costs and revenues associated with department management. Human resources, legal, and policy concepts related to outpatient, inpatient, public, and private sectors are examined.

RESP 6101. Respiratory Care Leadership. (3) Provides an in-depth knowledge of foundations, scholarship, and practice of leadership. Introduces concepts related to leading people and managing resources into the future. Focuses on using an evidence-based approach to making decisions in a complex healthcare environment.

RESP 6102. Pulmonary Disease Management. (3) Corequisite(s): RESP 6101. A case-based exploration of pulmonary disease management that presents the pathophysiology, diagnosis, and management of common respiratory diseases that Respiratory Therapists encounter in clinical practice. Didactic content is presented online, and students lead synchronous discussion of cases online and manage related discussion forums on topics related to specific disease entities. The course is organized into 4 modules that address respiratory insufficiency, airway diseases, inflammatory lung disease, and a final module on neuromuscular disease, lung cancer, and postoperative pulmonary complications.

RESP 6103. Cardiovascular Disease Management. (3) A case-based exploration of cardiovascular disease management that presents the pathophysiology, diagnosis, and management of common cardiovascular diseases that Respiratory Therapists encounter in clinical practice. Didactic content is presented online, and students lead synchronous discussion of cases online and manage related discussion forums on topics related to specific disease entities. The course is organized into 4 modules that address cardiac insufficiency, structural diseases, vascular disease, and a final module on sleep-disordered breathing, trauma, dysrhythmias, and end-of-life care.

RESP 6104. Health Policy, Law, and Ethics in the Health Professions. (3) An overview of health policy, law, and ethics in relation to allied health professionals and in the broader health care context. Explores essential issues related to development of health policy and law.

RESP 6105. Pulmonary Function Testing and Cardiopulmonary Rehabilitation. (3) An introduction to open and closed systems of pulmonary function testing, including the theory and operations of the body plethysmograph. The management and quality control of the pulmonary function lab is discussed. Also included are selected theories and practices in pulmonary rehabilitation and the planning of the components of an effective comprehensive multi-disciplinary pulmonary rehabilitation program. Topics and emphasis may vary.

RESP 6106. Ventilation Application and Monitoring. (3) Provides in-depth knowledge of advanced theory, set-up, operation, and maintenance of mechanical ventilators and related equipment, as well as instruction on all phases of continuous mechanical ventilation. The history of mechanical ventilation, modes of mechanical ventilator support, implementation, monitoring, ventilator weaning and discontinuation are covered. Cutting-edge ventilator modes, noninvasive ventilators and high frequency oscillators are discussed. The integration of advanced techniques for invasive and noninvasive patient monitoring is also reviewed. Topics and emphasis may vary.

RESP 6110. Cardiopulmonary Disease Management. (3) A case-based exploration of disease management that presents the pathophysiology, diagnosis, treatment, and management of cardiopulmonary diseases commonly encountered in clinical practice. Emphasis is placed on using an evidence-based practice approach. Cardiopulmonary disease topics and emphasis may vary.

RESP 6111. Patient-Centered Care in Cardiopulmonary Disease. (3) Explores the complex concepts of patient engagement and behavior change across the spectrum of cardiopulmonary disease. Emphasis is placed on practical strategies to effectively engage patients in their self-care.

RESP 6115. Research Methods for Respiratory Care. (3) Methods of inquiry for research are explored and critiqued within the field of respiratory care, with an emphasis on developing skills useful for conducting and evaluating basic, applied, and clinical research. Students review a selection of appropriate basic statistics and analysis of data.

RESP 6116. Inquiry and Application of Evidence-Based Practice. (3) Prerequisite(s): RESP 6115, Permission of Department for students not enrolled in the MSRC program. Prepares students to evaluate the medical

literature for reliability and validity in its application to determining the usefulness of diagnostic tests, efficacy of therapy, measures of clinically meaningful change, and prognosis.

RESP 6120. Advanced Cardiopulmonary Diagnostics and Therapeutics. (3) Prerequisite(s): RESP 6105, RESP 6110.

Examines disease-specific application of diagnostic and therapeutic interventions, techniques, and procedures. Integrates critical diagnostic thinking and evidence-based practice in advanced respiratory care practice.

RESP 6202. Respiratory Care Advanced Practice. (3)

Prerequisite(s): Permission of Department for students not enrolled in the MSRC program. Introduces students to the expectations of advanced respiratory care practice in a variety of healthcare settings. Emphasis will be placed on clinical leadership and inter-professional collaborative practice.

RESP 6404. Clinical Practice in Advanced Respiratory Care I. (3) Restricted to students enrolled in the MS in

Respiratory Care (MSRC) program. An orientation to the clinical environments and the initial application of didactic material in supervised clinical education and experiences in areas of advanced respiratory clinical practice for diagnosis, treatment, and management of patients with cardiopulmonary diseases. Conferences during the clinical practice rotations provide opportunities to review current research and practice issues. 240 clinical hours.

RESP 6405. Clinical Practice in Advanced Respiratory Care II. (2) Prerequisite(s): RESP 6404. Supervised clinical

education and experiences in areas of advanced respiratory clinical practice for diagnosis, treatment, and management of patients with cardiopulmonary diseases. Conferences during the clinical practice rotations provide opportunities to review current research and practice issues. 240 clinical hours.

RESP 6406. Clinical Practice in Advanced Respiratory Care III. (3) Prerequisite(s): RESP 6405. Continuation of supervised

clinical education and experiences in areas of advanced respiratory clinical practice for diagnosis, treatment, and management of patients with cardiopulmonary diseases. Conferences during the clinical practice rotations provide opportunities to review current research and practice issues. 360 clinical hours.

RESP 6407. Clinical Practice in Advanced Respiratory Care IV. (3) Prerequisite(s): RESP 6406. Final clinical rotation of

supervised clinical education and experiences in areas of advanced respiratory clinical practice for diagnosis, treatment, and management of patients with cardiopulmonary diseases. Conferences during the clinical

practice rotations provide opportunities to review current research and practice issues. 240 clinical hours.

RESP 6601. Emerging Issues in Respiratory Care Seminar. (3)

Explores emerging issues of interest related to respiratory care and healthcare in the broader context. Topics and emphasis may vary.

RESP 6605. Project Development I. (1) Prerequisite(s): RESP

6115, RESP 6116. This is the first course in a series in which students develop a scholarly practice-based project in a selected topic area related to advanced respiratory clinical practice. Emphasis is placed on refining a problem statement, assessing need, and developing the project.

RESP 6606. Project Development II. (1) Prerequisite(s): RESP

6605. This is the second course in a series in which students develop a scholarly practice-based project in a selected topic area related to advanced respiratory clinical practice. Emphasis is placed on the project development and implementation.

RESP 6607. Project Development III. (1) Prerequisite(s): RESP

6606. This is the third course in a series in which students develop a scholarly practice-based project in a selected topic area related to advanced respiratory clinical practice. Emphasis is placed on analyzing project outcomes and oral presentation.

RESP 6801. Advanced Credential Exam Preparation

Course. (3) Prerequisite(s): RESP 6101, RESP 6102, RESP 6103, and RESP 6105. Prepares M.S. in Respiratory Care students for an National Board of Respiratory Care (NBRC) specialty exam of interest. These may include, but are not limited to, the ACCS, NPS, or RPFT credentialing exam. Topics and emphasis may vary. Credit by exam is given to students who have already successfully completed all advanced credentialing exams offered by the NBRC.

RESP 6802. Respiratory Care Capstone. (7) Prerequisite(s):

RESP 6101, RESP 6102, RESP 6103, and RESP 6601. Students develop a project in their clinical, community, or educational environment that impacts positive change, with the focus on quality improvement, management, education, research, or advanced clinical practice at the discretion of the student under faculty guidance. Elements include interviews, data management, and literature review that culminate in a systematic review, poster, oral presentation, and a comprehensive paper documenting the project.

RESP 6803. Respiratory Care Capstone I. (3) Prerequisite(s):

RESP 6101, RESP 6106, and RESP 6115. Students develop a project in their clinical environment, community, or educational environment that impacts positive change. The focus is on quality improvement, management, education, research, or advanced clinical practice at the discretion of the student under faculty guidance. Emphasis is placed on

the development, refinement, and presentation of the capstone project proposal.

RESP 6804. Respiratory Care Capstone Project. (3)

Prerequisite(s): RESP 6803. Students complete a project in their clinical, community, or educational environment that impacts positive change. The focus is on quality improvement, management, education, research, or advanced clinical practice at the discretion of the student under faculty guidance.

Educational Research, Measurement, and Evaluation (RSCH)

RSCH 6101. Research Methods. (3) An orientation to designs and procedures utilized in educational research, emphasizing basic principles for conducting research, interpreting and evaluating published articles representative of educational problems and issues.

RSCH 6109. Assessment and Evaluation Methods. (3)

Prerequisite(s): RSCH 6101 or equivalent. Fundamentals of individual and group assessment, including selection, administration, and interpretation of norm-referenced and criterion-referenced assessment instruments and demonstration of competencies prescribed by the State of North Carolina and other professional organizational standards.

RSCH 6110. Descriptive and Inferential Statistics. (3)

Prerequisite(s): RSCH 6101 or equivalent. Identification of objective reporting and decision-making statistics; application of descriptive and inferential methods; illustration of elementary parametric and non-parametric techniques in hypothesis testing; and, demonstration of the fundamentals of data processing.

RSCH 6120. Advanced Statistics. (3) Prerequisite(s): RSCH 6101 and RSCH 6110 or equivalent. Application of advanced topics in probability and statistics as a basis for objective decision-making, with emphasis on the following practices through analysis of prepared data: multiple correlation and regression, one-way and n-way analysis of variance and covariance, advanced ANOVA designs, advanced non-parametric methods, and, selected multivariate statistical procedures.

RSCH 6800. Independent Study in Research. (3) Faculty-directed independent study of topics not provided by other research course offerings and/or to examine, extend, and enrich extant research knowledge through supervised individual study.

RSCH 7111. Qualitative Research Methods. (3) Cross-listed Course(s): RSCH 8111. Demonstration of historical, philosophical, biographical, ethnographic, and case study methods; location of information sources, application of methods of data collection and analysis, field techniques, and strategies for writing research results.

RSCH 7112. Survey Research Methods. (3) Cross-listed Course(s): RSCH 8112. Prerequisite(s): RSCH 6101 or equivalent. Techniques of survey research, including developing proposals, addressing ethical issues, selecting direct and indirect methods, preparing questionnaires, sampling, analyzing and presenting data, writing research reports, extending applications to program evaluation.

RSCH 7113. Single-Case Research. (3) In-depth study of single-case research methods, including data collection, research designs, data display and analysis, and report writing.

RSCH 7140. Multivariate Statistics. (3) Cross-listed Course(s): RSCH 8140. Prerequisite(s): RSCH 6101, RSCH 6110, and RSCH 6120, or equivalent. Multiple regression, multivariate analysis of variance, discriminant function analysis, factor analysis, and other multivariate methods applied to descriptive, correlational, and experimental research problems.

RSCH 7150. Structural Equation Modeling. (3) Cross-listed Course(s): RSCH 8150. Prerequisite(s): RSCH 6110 and RSCH 6120, or equivalent. Applies general statistical modeling techniques to establish relationships among variables. Topics include: regression models, path analysis models, exploratory and confirmatory factor analyses, latent variables, basic steps in structural equation modeling, multiple indicators and multiple causes (MIMIC) model, multi-group model, multilevel model, mixture model, structured mean model, second order factor model, latent variable growth model, and dynamic factor model.

RSCH 7160. Hierarchical Linear Models in Education. (3) Cross-listed Course(s): RSCH 8160. Prerequisite(s): RSCH 6110 and RSCH 6120. An applied course in hierarchical linear models. Emphases are placed on practical issues, such as selecting appropriate statistical analyses to investigate research questions, using SPSS, HLM, and SAS to analyze data, interpret results, and applying the analyses in research areas of interest.

RSCH 7196. Program Evaluation Methods. (3) Cross-listed Course(s): RSCH 8196. Examination of principles, strategies, and techniques of program evaluation in order to identify, clarify, and apply defensible criteria that indicate a program's value, quality, utility, effectiveness, and/or significance.

RSCH 7197. Design and Analysis of Experimental and Quasi-Experimental Evaluations. (3) Cross-listed Course(s): RSCH 8197. Prerequisite(s): RSCH 6101 and RSCH 6110 or equivalents. Critical examination of the theoretical, ethical, and practical strategies involving the design and analysis of experiments and quasi-experiments to promote causal inference in evaluation studies and lead to defensible claims of effectiveness, practical significance, and value.

RSCH 8110. Descriptive and Inferential Statistics. (3) Prerequisite(s): RSCH 8210 or equivalent. Identification of objective reporting and decision-making statistics; application of descriptive and inferential methods; illustration of elementary parametric and non-parametric techniques in hypothesis testing; and, demonstration of the fundamentals of data processing.

RSCH 8111. Qualitative Research Methods. (3) Cross-listed Course(s): RSCH 7111. Demonstration of historical, philosophical, biographical, ethnographic, and case study methods; location of information sources, application of methods of data collection and analysis, field techniques, and strategies for writing research results.

RSCH 8112. Survey Research Methods. (3) Cross-listed Course(s): RSCH 7112. Prerequisite(s): RSCH 8210 or equivalent. Techniques of survey research, including developing proposals, addressing ethical issues, selecting direct and indirect methods, preparing questionnaires, sampling, analyzing and presenting data, writing research reports, extending applications to program evaluation.

RSCH 8113. Single-Case Research. (3) In-depth study of single-case research methods (i.e., data collection, research designs, data display and analysis, and proposal writing), using single-case research to establish evidence-based practices, and effect size metrics for single-case research.

RSCH 8120. Advanced Statistics. (3) Prerequisite(s): RSCH 8210 and 8110 or equivalent. Application of advanced topics in probability and statistics as a basis for objective decision-making, with emphasis on the following practices through analysis of prepared data: multiple correlation and regression, one-way and n-way analysis of variance and covariance, advanced ANOVA designs, advanced non-parametric methods, and, selected multivariate statistical procedures.

RSCH 8121. Qualitative Data Collection and Analysis. (3) Prerequisite(s): RSCH 8111 or permission of instructor. An advanced qualitative research methods course introducing various qualitative data collection and analysis techniques. Multiple analytic strategies are surveyed and compared from a range of social sciences. Also provides a practical introduction to the use of computer packages for qualitative data analysis.

RSCH 8131. Interviewing as Qualitative Inquiry. (3) Prerequisite(s): RSCH 8111. Interviewing as a data collection method in qualitative research. Primary focus will be on semi-structured interviewing ideologies and processes. The course will cover all aspects of interviewing, providing a corpus of knowledge and skills needed to conduct qualitative interview research studies through examination of strengths, weaknesses, and critique of the method. Additionally learners will conduct interviews across a variety of contexts and reflect on their process, outcome, and ethics and the role of interviewing in promoting equitable and socially just research.

RSCH 8140. Multivariate Statistics. (3) Cross-listed Course(s): RSCH 7140. Prerequisite(s): RSCH 8210, RSCH 8110, and RSCH 8120 or equivalent. Multiple regression, multivariate analysis of variance, discriminant function analysis, factor analysis, and other multivariate methods applied to descriptive, correlational, and experimental research problems.

RSCH 8150. Structural Equation Modeling. (3) Cross-listed Course(s): RSCH 7150. Prerequisite(s): RSCH 8110 and RSCH 8120, or equivalent. Applies general statistical modeling techniques to establish relationships among variables. Topics include: regression models, path analysis models, exploratory and confirmatory factor analyses, latent variables, basic steps in structural equation modeling, multiple indicators and multiple causes (MIMIC) model, multi-group model, multilevel model, mixture model, structured mean model, second order factor model, latent variable growth model, and dynamic factor model.

RSCH 8160. Hierarchical Linear Models in Education. (3) Cross-listed Course(s): RSCH 6160. Prerequisite(s): RSCH 8110 and RSCH 8120. An applied course in hierarchical linear models. Emphases are placed on practical issues, such as selecting appropriate statistical analyses to investigate research questions, using SPSS, HLM, and SAS to analyze data, interpret results, and applying the analyses in research areas of interest.

RSCH 8196. Program Evaluation Methods. (3) Cross-listed Course(s): RSCH 7196. Examination of principles, strategies, and techniques of program evaluation in order to identify, clarify, and apply defensible criteria that indicate a program's value, quality, utility, effectiveness, and/or significance.

RSCH 8197. Design and Analysis of Experimental and Quasi-Experimental Evaluations. (3) Cross-listed Course(s): RSCH 7197. Prerequisite(s): RSCH 8110 and RSCH 8210 or equivalents. Critical examination of the theoretical, ethical, and practical strategies involving the design and analysis of experiments and quasi-experiments to promote causal inference in evaluation studies and lead to defensible claims of effectiveness, practical significance, and value.

RSCH 8210. Applied Research Methods. (3) Advanced study of qualitative (e.g., Case Study, Ethnography, Grounded Theory) and quantitative (e.g., Experimental, Single Subject, Descriptive, Correlational, Causal-Comparative) research methods and evaluation research approaches.

RSCH 8220. Educational and Psychological Measurement. (3) Prerequisite(s): RSCH 8110 or equivalent. Focuses on the basic principles of educational and psychological measurement. Concepts needed to evaluate and interpret results from standardized measures are emphasized. The course is devoted to developing fundamental measurement concepts and an understanding of common issues such as standard settings, differential item functioning, computerized adaptive testing, and scale linking and equating.

RSCH 8230. Theory and Applications of Measurement. (3) Prerequisite(s): RSCH 8110 or equivalent. Primary focus on methods of constructing instruments used in educational and psychological contexts for evaluation purposes, particularly instruments designed to measure student achievement and psychological constructs. Various stages of instrument development are considered with a focus on optimizing validity and reliability of scores. In addition, some fundamental psychometric theories including classical test theory, item response theory, and/or generalizability theory are also covered.

RSCH 8410. Internship in Educational Research. (3) Prerequisite(s): RSCH 8140 or equivalent. Issues and concepts in statistical consulting, educational research design, and educational measurement are applied to practical problems in the field. This course supports the professional development of doctoral students as they gain experience applying educational research methods to research projects for school systems and related agencies. *Graded on a Pass/Unsatisfactory basis.*

RSCH 8411. Internship in Teaching Educational Research. (3) Prerequisite(s): RSCH 8210. Issues and concepts in teaching adults and preparing educational researchers are applied in the college teaching experience. This course supports doctoral students as they experience a graduated co-teaching process ultimately resulting in assumption of full college teaching responsibilities for university courses in educational research topics. *Graded on a Pass/Unsatisfactory basis.*

RSCH 8699. Dissertation Proposal Design. (3) Identification and definition of a research area and development of a proposal draft for an original research study appropriate for the dissertation requirement. *Graded on a Pass/Unsatisfactory basis.*

RSCH 8800. Independent Study in Research. (3) Faculty-directed independent study of topics not provided by other research course offerings and/or to examine, extend, and enrich extant research knowledge through supervised individual study.

RSCH 8890. Special Topics in Research. (3) Faculty-directed study and in-depth analysis of a selected area of research.

RSCH 8999. Dissertation. (1 to 6) Under the direction of a dissertation advisor and committee, students are expected to design and execute an original research study. This study should address a significant issue or program related to educational research. *Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term. May be repeated for credit up to 6 credit hours.*

Secondary Education (SECD)

SECD 5140. The Secondary School Experience. (2) Overview of the developmental characteristics of the adolescent learner and their relationship to instruction. Context of American High Schools and the effects of those schools on the learning of contemporary adolescents. Reform efforts currently underway in American high schools that attempt to address some of the problems with current practice. Extensive clinical experience is required.

SECD 6470. Secondary Education Student Teaching Internship. (3 to 5) Prerequisite(s): ENGL 5254, MAED 5252, MDSK 4253, MDSK 5204, MDSK 5251, MDSK 5255, MDSK 5300, MDSK 6162, MDSK 6252. Completion of all degree and professional education requirements. Prior Admission to the Graduate Certificate in Teaching Program or the Master of Arts in Teaching Program Completion of all other coursework in a student's program of study GPA of 3.0 and no more than two grades of C in all professional education courses. GPA of 2.50 and grades of C or higher in the area of teaching specialization. Overall GPA of 2.50 or higher. Faculty advisor's recommendation certifying readiness to student teach. Additional requirements as determined by specific teacher education programs. Documentation of completion of field experiences in one diverse setting. Cross-listed Course(s): MDLG 6470, MDSK 6470. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned

15 weeks in a school setting, including a range of seminars. Participating students pay a course registration fee for edTPA portfolio assessment. *SECD 6470 can be taken multiple times if a candidate withdraws from the class.*

SECD 6800. Individual Study in Secondary Education. (1 to 6) Prerequisite(s): Permission of the student's advisor.

Sociology (SOCY)

SOCY 5090. Topics in Sociology. (3) Prerequisite(s): Permission of instructor. Intensive treatment or survey of related topics, depending on student needs and interests. *May be repeated for credit with change of topic.*

SOCY 5125. Urban Sociology. (3) Cross cultural analysis of urban development, social structure, ecology, demographic composition, and social problems.

SOCY 5130. Sociology of Health and Illness. (3) The cultural and structural influences on the definition of health and illness; models of illness behaviors; health demography and epidemiology; social influences on the delivery of healthcare; ethical issues surrounding health and illness; the development of relevant social policy.

SOCY 5151. Pro-Seminar: Social Problems and Social Policy. (3) Prerequisite(s): graduate student in sociology or senior sociology major. Introduction to the discipline of sociology and the UNC Charlotte department; basic skills for graduate school. *Graded on a Pass/Unsatisfactory basis.*

SOCY 5156. Quantitative Analysis. (4) Prerequisite(s): SOCY 4155 or permission of instructor. Concepts and procedures of sociological analysis; data processing; measurement theory; and quantitative models of analysis. Three hours of lecture/discussion and completion of weekly laboratory units.

SOCY 5156L. Quantitative Analysis Laboratory. (0) Corequisite(s): SOCY 5156. Required weekly laboratory session for Quantitative Analysis.

SOCY 5290. The Experience of Loneliness. (3) Cross-listed Course(s): GRNT 4290, GRNT 5290, and SOCY 4290. Explores the experience of loneliness among older adults in society. Drawing on academic texts, empirical research and personal accounts of loneliness, the aim is to identify the extent of loneliness experienced by older adults in various contexts. In particular, the readings consider the consequences of loneliness on the physical, mental, and social well-being of older adults.

SOCY 6090. Topics in Sociology. (3) Prerequisite(s): Permission of department. Intensive treatment of a topic

or survey of related topics, depending on student needs and interests. *May be repeated for credit with change of topic.*

SOCY 6112. The Sociology of Work. (3) Theoretical and methodological approaches to work; work in a globalized society; work structures; inequalities at work; success at work; gender, race, ethnicity and age differences in the workplace; work-family balance; workplace transformation; historical studies of work; labor markets, employment and unemployment; work rewards; workplace and employment policies.

SOCY 6130. Sociology of Aging: Theories and Research. (3) Cross-listed Course(s): GRNT 6130. Application of stratification theories and demography are applied to the older population. Issues of race, gender, socio-economic status, age, and geographic distribution are examined to investigate the diversity of the older age group and their access to resources.

SOCY 6134. Family Caregiving Across the Lifespan: Theory, Practice, and Policy. (3) Cross-listed Course(s): GRNT 6134 and SOWK 6134. Theories explaining the formation and functioning of American families with an emphasis on the impact of the aging of society. Examines the current demographic trends and expectations of multigenerational families, with a focus on family caregiving. Addresses family care across the lifespan as a lifelong developmental construct, and examines evidence-based approaches to practice, education, research, and policy. Students examine a broad spectrum of care situations (from developmental disability to chronic illness, dementia care, and end of life) that necessitate family caregiving throughout the lifespan and discuss responses to these challenges by both caregiving families and caregiving systems.

SOCY 6135. Social Context of Schooling. (3) The political economy of schooling; race, class, and gender effects on educational processes and outcomes; the school as a complex organization; the sociology of school reform movements.

SOCY 6136. Qualitative Research Methods. (3) Collection and analysis of qualitative data including use of grounded theory and a variety of qualitative techniques, consideration of ethical issues and the use of data.

SOCY 6137. The Political Economy and School Reform. (3) Prerequisite(s): SOCY 4135, graduate standing, or permission of instructor. Relationship between the business community's vision for school reform and the school restructuring movement locally and nationally, including social and political processes associated with corporate involvement in defining the problem with schools and shaping solutions, the intersection of education and the

economy, and the relationship between schooling and social inequality.

SOCY 6138. Social Organization of Healthcare. (3) Focuses on the structures and operations of healthcare institutions and providers. The topics covered include the socio-historical development of the existing healthcare system, healthcare occupations and professions, professional power and autonomy, professional socialization, inter-professional and provider-patient relations, healthcare organizations and the delivery of services, and how social change affects the healthcare sector.

SOCY 6614. Self and Society. (3) Examination of theoretical constructs and substantive concerns relevant to the socialization process; comparison of symbolic interactionism, ethnomethodology, phenomenology; emphasis on social construction of reality in various "social worlds" (deviant, work, family).

SOCY 6615. Dilemmas in Organizations. (3) Examines organizational theory and research focused on organizational behavior, inter-organizational relations, relations with external stakeholders and organizational culture. Case study analysis, group-problem solving and the study of concrete organizational dilemmas.

SOCY 6616. Stratification and Inequality. (3) Examination of theories of stratification and the causes, processes and social consequences of economic and political inequality; assumptions behind, mechanisms for, and consequences of government and private sector strategies to address problems associated with inequality.

SOCY 6617. Data Utilization. (3) Methodological and statistical strategies for applied sociological research within organizational settings; selecting the best strategies consistent with budgetary, manpower and organizational constraints; interpreting and communicating research results in ways understandable to and useful for organizational decision-makers.

SOCY 6630. Investigating Health and Health Services. (3) Prerequisite(s): SOCY 4130, or graduate standing, or permission of instructor. Useful to those seeking research careers, to administrators in healthcare, and to primary care providers. How to conduct and evaluate research in healthcare settings, emphasizing both quantitative and qualitative methodologies as well as the utilization of secondary data.

SOCY 6635. The Social Context of Mental Health. (3) Cross-listed Course(s): SOWK 6635, PSYC 8636, and PPOL 8636. Prerequisite(s): Admission to graduate program or permission of instructor. This course draws upon contributions from the field of psychiatry, psychology, social work, and anthropology. The focus is on mental

health and illness it is social context, with an emphasis on the relationship between social structure and mental health/disorder. We will examine the social factors which shape psychiatric diagnosis, the effects of socio-demographic variables on mental health, and the role of social support and stress for different groups. The course also examines the organization, delivery, and evaluation of mental health services, and mental healthcare policy.

SOCY 6640. Evaluation Research for Applied Sociology. (3) Prerequisite(s): SOCY 6652 and introductory statistics. Evaluation research from an applied sociological perspective, including incorporation of social theory, substantive social science knowledge, and research techniques into the evaluation of a variety of programs, interventions, and policies.

SOCY 6651. Social Theory. (3) Analysis of contemporary social theories, with emphasis on their implications for planned change.

SOCY 6652. Issues in Social Research. (3) Examination of epistemology of social research; assumptions and methods of specific research strategies; ethical and policy issues of applied and academic research.

SOCY 6895. Tutorial in Sociology. (1 to 4) Prerequisite(s): Permission of instructor. Directed reading and/or research; development of expertise in substantive area. *May be repeated for credit.*

SOCY 6897. Research Practicum. (1 to 6) Prerequisite(s): SOCY 6651 and 6652. Preparation of research paper based upon research completed within a community organization or agency. The student will develop a consultant-client relationship with the agency or organization and conduct a research/evaluation project on behalf of the agency or organization (such as a needs assessment, program evaluation, social impact assessment or policy analysis). *May be repeated for credit.*

SOCY 6996. Thesis. (1 to 6) Prerequisite(s): completion of all other coursework and admission to candidacy by Graduate Committee. Applied, academic, or theoretical research project, defended before graduate faculty. *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit up to 6 credit hours.*

Social Work (SOWK)

SOWK 5090. Topics in Social Work. (1 to 3) Cross-listed Course(s): SOWK 4090. Specialized topics in social work. *May be repeated for credit two times.*

SOWK 5101. Social Work Practice with Older Adults and Families. (3) Cross-listed Course(s): SOWK 4101 and GRNT 5050. Provides an opportunity to integrate the theories and practice skills needed for effective social work and services to with older adults and their families.

SOWK 5102. School Social Work. (3) Exploration of school social work practices from a theoretical as well as practical point of view. Also focuses on the roles of school social workers and the type of issues they confront.

SOWK 5103. Child Welfare. (3) Prerequisite(s): Permission of MSW Program Director or instructor. Examination of the history, purpose, and goals of child welfare services in North Carolina and in the United States. Course information is provided from the context of the child- and family-centered model that guides child welfare services.

SOWK 5104. Interprofessional Collaboration in Healthcare. (3) Cross-listed Course(s): NURS 6282. Prerequisite(s): Enrollment in IBHS program. Provides interprofessional education opportunities to prepare health professionals for team-based care of patients, families, and communities. Focuses on the use of ethical care, effective communication, and teamwork and collaborative practice to improve health outcomes. Emphasis on frameworks for understanding health and principles of patient and family-centered care to improve physical, mental, and social well-being.

SOWK 5105. Telehealth Interventions for Youth and Families. (3) Introduction to evidence-based, tele-behavioral health practices with youth and families. The course discusses strategies to ensure ethical standards in telehealth, deliver culturally-informed, holistic services, and how to assess, intervene, and evaluate tele-behavioral health interventions.

SOWK 5109. Systems of Care for Vulnerable Populations. (3) Cross-listed Course(s): SOWK 4109. Focuses on engaging diversity and difference in practice in relation to social work skills with individuals, families, and groups.

SOWK 5110. Social Work Practice with Immigrants and Refugees. (3) Cross-listed Course(s): SOWK 4110. Students develop the skills, knowledge, values, and critical thinking capacity to practice social work with immigrants and refugees. Students: 1) describe historical and theoretical perspectives of migration, 2) analyze the intersection of migration with core areas of social work practice, including child welfare, criminal justice, education, mental health, and health systems, and 3) develop culturally responsive advocacy efforts and intervention strategies to improve immigrant and refugee well-being.

SOWK 5111. Promoting Healing Through Mindfulness and Resiliency. (3) Integrates the theories and practice skills needed for effective social work with older adults with major physical and mental health concerns and the older adults' families.

SOWK 5112. Forensic Social Work. (3) Forensic social work is the application of social work to questions and issues relating to judicial and legal systems. This specialty of the social work profession includes, but is not limited to: child custody issues, implications of child abuse and domestic violence, juvenile and adult justice services, corrections, competency and commitment, civil liberties and rights, mass incarceration, and probation and parole.

SOWK 5113. Mental Health and Substance Use. (3) Increases awareness of mental health and substance abuse issues with both macro and micro practices being highlighted. Empowers students to engage as agents of change for those vulnerable populations affected by mental illness and/or substance use disorders.

SOWK 5114. Social Work to Improve LGBT+ Health & Wellbeing. (3) A system-level examination of social work practice and its impact on the health and well-being of LGBT+ community.

SOWK 5125. Social Development in Malawi. (3) Cross-listed Course(s): SOWK 4125. Students actively participate in several pre-departure class lectures and work sessions. They travel to Malawi for 11 days and engage in service-learning activities aligned with social development in rural Malawi. Experiential projects are designed and implemented by students using funds they raise. Sustainability and anti-oppressive approaches to social development are highlighted.

SOWK 5126. Health and Well-Being in India. (3) Cross-listed Course(s): SOWK 4126, HLTH 4090, and HLTH 6090. This Study Abroad course covers topics related to health and well-being in India.

SOWK 5280. The Experience of Dementia. (3) Cross-listed Course(s): GRNT 4280, GRNT 5280, SOWK 4280. An overview of Alzheimer's disease and related dementias with a focus on the biological, neurological, and social aspects of these diseases. Students will gain a holistic insight into these diseases and their implications for both individuals and society.

SOWK 5353. Environments for Aging. (3) Cross-listed Course(s): GRNT 4353, GRNT 5353, SOWK 4353. With roots in environmental psychology, this course explores the ways in which older adults experience and interact with their physical environment at both the macro and micro levels. Students will be introduced to the Americans with Disabilities Act, Universal Design, Age-Friendly

communities, and housing options for older adults. This course will examine these programs from a national and local viewpoint.

SOWK 5365. Grief and Loss over the Lifespan. (3) Cross-listed Course(s): GRNT 5365, GRNT 4365, and SOWK 4365. Equips the professional practitioner to understand and respond effectively to individuals, families, groups, organizations, and communities experiencing both symbolic and tangible losses and accompanying grief reactions. Topics include: theories of normal and complicated grief, factors that influence grief at different stages of the lifespan, cultural and spiritual influences, traumatic loss, anticipatory grief and end of life care, the impact of loss and working in close contact with grief on professionals, and skills and strategies that address therapeutic needs of vulnerable and resilient populations experiencing grief.

SOWK 5366 Early Childhood Mental Health. (3)
Prerequisite(s): Must be enrolled in Social Work MSW program and/or Early Childhood Mental Health Certification Program. Cross-listed Course(s): SOWK 4366. Highlights the relevance of early relationships between children and their parents, families, and other care providers to later health, mental health, and social adjustment. The emphasis will be on how the social environment and neuroanatomy during the earliest years of life interact to shape later functioning. This course will cover basic evidence-based prevention and interventions for young children and their caregivers. IECMH Endorsement: This course partially addresses Competency Guidelines for Endorsement for Culturally Sensitive, Relationship-Focused Practice Promoting Infant and Early Childhood Mental Health®

SOWK 6121. Social Work Practice: Theories and Skills. (3)
Prerequisite(s): Enrollment in MSW or permission of department. Introduces the theories of human behavior and models of social work intervention necessary to engage all levels of client systems. Also introduces the skills necessary to identify, analyze, and implement evidence-based interventions to achieve client goals.

SOWK 6131. Social Work Research. (3) Prerequisite(s): Enrollment in MSW or permission of department. Introduction of social science research methods and their relevance to social work. Other content relates to the application of critical thinking and how to engage in research-informed practice and practice-informed research.

SOWK 6134. Family Caregiving Across the Lifespan: Theory, Research, and Policy. (3) Cross-listed Course(s): GRNT 6134 and SOCY 6134. Family caregiving is a lifelong process that occurs throughout one's life. Family care as a lifelong developmental construct is discussed, and students

learn about current theoretical frameworks, areas of practice, education, research, and policy. A broad spectrum of care situations (from developmental disability to chronic illness, dementia care, and end of life) are examined and how caregivers and their families respond to these challenges. Provides insights and ideas for researchers, practitioners, and graduate students across the caregiving fields, including psychology, social work, public health, sociology, and others.

SOWK 6141. Foundations of Social Work. (3)
Prerequisite(s): Enrollment in MSW or permission of department. Introduction to the profession of social work, with attention to social work history, social welfare history, and current social policies and programs that influence the contexts of social work practice. Professional values, identity, and critical thinking are discussed in relationship to current and historical understandings of social problems and policy responses.

SOWK 6151. Social Work, Social Justice, and Diversity. (3)
Prerequisite(s): Enrollment in MSW or permission of department. Examines individual, systemic, and ideological factors related to diversity and social justice. Theories and perspectives that contribute to understanding oppression and privilege are emphasized. Implications for social work practice, research, and policy are examined. Strategies to counter discrimination and oppression are identified. Requires considerable critical analysis and self-reflection on the part of participants.

SOWK 6232. Practice and Program Evaluation. (3)
Prerequisite(s): Enrollment in MSW or permission of department. Demonstrates how to engage in research-informed practice and practice-informed research. Managing client data and critically analyzing, monitoring, and evaluating interventions are covered in-depth.

SOWK 6242. Advocacy and Policy Change. (3)
Prerequisite(s): Enrollment in MSW or permission of department. The role of advocacy in the social work profession, tools for bringing about policy change, and use of advocacy to promote social justice, especially for vulnerable populations.

SOWK 6252. Mental Health Assessment. (3) Prerequisite(s): Enrollment in MSW or permission of department. An overview of social work theories related to mental/behavioral health assessment with special emphasis on and critique of the APA *Diagnostic and Statistical Manual of Mental Disorders* (DSM).

SOWK 6441. Foundation Social Work Practicum I. (3)
Prerequisite(s): Enrollment in MSW or permission of department. The Foundation field practicum prepares students to apply generalist social work knowledge, skills, values, and ethical principles gained in the classroom to

social work practice. Students work in an approved field site under the supervision of a social work field instructor and attend a monthly seminar.

SOWK 6442. Foundation Social Work Practicum II. (3)

Prerequisite(s): SOWK 6441; and enrollment in MSW or permission of department. The Foundation field practicum that prepares students to apply generalist social work knowledge, skills, values, and ethical principles gained in the classroom to social work practice. Students work in an approved field site under the supervision of a social work field instructor and attend a monthly seminar.

SOWK 6635. The Social Context of Mental Health. (3)

Cross-listed Course(s): SOCY 6635, PSYC 8636, and PPOL 8636. Prerequisite(s): Admission to graduate program or permission of instructor. Draws upon contributions from the field of psychiatry, psychology, social work, and anthropology. The focus is on mental health and illness in its social context, with an emphasis on the relationship between social structure and mental health/disorder. Social factors are examined which shape psychiatric diagnosis, the effects of socio-demographic variables on mental health, and the role of social support and stress for different groups. Also examines the organization, delivery, and evaluation of mental health services, and mental healthcare policy.

SOWK 7090. Special Topics in Social Work. (3) A topics course that is only available for graduate credit. *May be repeated for credit with change of topic.*

SOWK 7110. Cognitive Behavioral Therapy. (3) Restricted to SOWK students in MSW Program. Using the Cognitive Behavioral Therapy (CBT) framework, students will learn how to move from a comprehensive cognitive behavioral case conceptualization to treatment planning and intervention. Students will have the opportunity to implement specific Cognitive Behavioral Therapy techniques within the context of this course. This course will emphasize the integration of clinical expertise, knowledge of patient preferences and evidence-based interventions.

SOWK 7111. Acceptance and Commitment Therapy (ACT). (3)

Prerequisite(s): SOWK Graduate Student designation. This elective course introduces students to the foundational principles and techniques of Acceptance and Commitment Therapy (ACT), an evidence-based therapeutic approach rooted in mindfulness and behavioral change. Students will explore the theoretical underpinnings of ACT, including the six core processes that foster psychological flexibility. Emphasis will be placed on integrating ACT principles into diverse clinical and community settings.

SOWK 7112. Dialectical Behavior Therapy (DBT). (3)

Prerequisite(s): SOWK Graduate students. This elective course provides students with an introduction to the core principles and techniques of Dialectical Behavior Therapy (DBT), a structured, evidence-based approach developed to treat individuals experiencing emotional dysregulation and high-risk behaviors. This course emphasizes the integration of DBT techniques into clinical practice, preparing students to utilize DBT techniques and processes.

SOWK 7114. Clinical Social Work: Ethics, Theories, and Application. (3)

Prerequisite(s): SOWK 6252. Expands social work students' knowledge, values, and skills with regard to clinically focused social work. The course incorporates ASWB exam preparation, along with other assignments and resource links that are useful in the clinical realm.

SOWK 7120. Social Welfare and Philanthropy. (3)

Introduction to philanthropy which allows students, through a community-based project, to experience two predominant aspects of philanthropy – grant making and fundraising – with an emphasis on supporting the well-being of vulnerable populations.

SOWK 7122. Advanced Social Work Practice with Individuals. (3)

Prerequisite(s): Enrollment in MSW or permission of department. Expands social work students' knowledge, values, and skills with regard to advanced micro practice with individuals, especially members of vulnerable groups.

SOWK 7126. Advanced Social Work Practice with Groups. (3)

Prerequisite(s): Enrollment in MSW or permission of department. Theory and practice related to social work with small groups. Various approaches to group development and facilitation, including social change, therapeutic change, goal setting, and assessment in groups, with an emphasis on work with vulnerable populations.

SOWK 7127. Advanced Social Work Practice with Families. (3)

Prerequisite(s): Enrollment in MSW or permission of department. Expands social work students' knowledge, values, and skills with regard to advanced micro practice with families, especially members of vulnerable populations.

SOWK 7130. Trauma and Recovery: Theory and Intervention. (3)

The history and evolution of trauma theory and social movements, and exploration of the impact of trauma and healing upon survivors. Students master the foundational principles and basic skills of trauma intervention. Students also participate in a community project that involves learning about services available for trauma survivors locally.

SOWK 7160. Social Work Practice with Latino Communities. (3) Enhances knowledge, values, and skills with regard to practice with Latino communities in the United States. Integrates an experiential education component that includes a combination of classroom, community, and independent work. Spanish proficiency is not required but may assist with course material and experience.

SOWK 7222. Advanced Social Work Practice with Organizations. (3) Prerequisite(s): Enrollment in MSW program or permission of department. Introduction to organizational theory, administration, and change in the context of social work practice. Develops advanced skills in engaging, assessing, intervening, evaluating, and leading organizational change efforts.

SOWK 7223. Advanced Social Work Practice with Communities. (3) Prerequisite(s): SOWK 7222; and enrollment in MSW program or permission of department. Builds advanced practice skills in engagement, assessment, intervention, and evaluation in community social work practice. Critically examines power, stakeholders, leadership, and resources in community change efforts.

SOWK 7443. Advanced Social Work Practicum I. (3) Prerequisite(s): SOWK 6442 (Advanced Standing students are exempt from this prerequisite); and enrollment in MSW or permission of department. The Advanced field practicum prepares students for more specialized application of social work knowledge, values, and skills, with special attention to the needs of vulnerable populations. Students work in an approved field site under the supervision of a social work field instructor and attend a monthly seminar.

SOWK 7444. Advanced Social Work Practicum II. (3) Prerequisite(s): SOWK 7443; and enrollment in MSW or permission of department. The Advanced field practicum prepares students for more specialized application of social work knowledge, values, and skills, with special attention to the needs of vulnerable populations. Students work in an approved field site under the supervision of a social work field instructor and attend a monthly seminar.

SOWK 7651. Reflection and Synthesis. (3) Prerequisite(s): SOWK 7222; SOWK 7443; and enrollment in MSW or permission of department. Provides MSW students with an opportunity to practice personal reflection, synthesize their learning from the MSW program, and demonstrate competency.

Spanish (SPAN)

SPAN 5011. Studies in Spanish American Prose Fiction. (3) Cross-listed Course(s): LTAM 5311. Prerequisite(s): Post-

baccalaureate status, B.A. in Spanish, or permission of department. Studies of 19th and 20th century Spanish American prose fiction. *May be repeated for credit with change of topic.*

SPAN 5015. Studies in Regional Literature of the Americas. (3) Studies of Mexican, U.S. Latino/a, Central American, Caribbean, Andean, Amazonian, or Southern Cone literature, with readings from representative works. *May be repeated for credit with change of topic.*

SPAN 5016. Social, Political, Cultural, and Economic Issues in Hispanic Literature. (3) Contextual issues surrounding Hispanic literature. *May be repeated for credit with change of topic.*

SPAN 5050. Selected Topics in Spanish. (1 to 3) Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Consideration of a predetermined topic. *May be repeated for credit with change of topic.*

SPAN 5120. Advanced Business Spanish I. (3) Cross-listed Course(s): LTAM 5120. Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Advanced studies in Business Spanish, intensive practice in speaking, listening comprehension, reading, writing, and translation in functional business areas such as economics, management, and marketing.

SPAN 5121. Advanced Business Spanish II. (3) Cross-listed Course(s): LTAM 5121. Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Advanced studies in Business Spanish, intensive practice in speaking, listening comprehension, reading, writing, and translation in functional business areas such as marketing, finance, and import-export.

SPAN 5202. Twentieth Century Spanish Literature. (3) Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Treatment of major literary developments from the Generation of 1898 to present day. Lectures, discussions, and reports.

SPAN 5205. Novel of the Golden Age. (3) Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. El Lazarillo through El Criticón. Lectures, discussions, and reports.

SPAN 5210. Studies in Spanish American Poetry. (3) Cross-listed Course(s): LTAM 5310. Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of the department. Studies of 19th and 20th century Spanish American poetry.

SPAN 5212. Studies in Spanish American Theater. (3) Cross-listed Course(s): LTAM 5312. Prerequisite(s): Post-

baccalaureate status, B.A. in Spanish, or permission of the department. Studies of 20th century Spanish American theater.

SPAN 5213. Cervantes. (3) Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, or permission of department. Study of Cervantes' masterpiece *Don Quixote*, as well as his other works.

SPAN 5410. Professional Internship in Spanish. (1 to 6) Prerequisite(s): Post-baccalaureate status, B.A. in Spanish, and permission of the department. Faculty-supervised field and/or research experience in a cooperating profession (e.g., business) or community organization. Contents of internship based upon a contractual agreement among the student, department, and business or community organization. *Graded on a Pass/Unsatisfactory basis.*

SPAN 5800. Directed Individual Study. (1 to 3) Prerequisite(s): Post-baccalaureate status, B.A. in Spanish or permission of the department. Individual work on a selected area of study. To be arranged with the instructor, generally during the preceding semester. By special permission only. *May be repeated for credit.*

SPAN 6001. Advanced Studies in Spanish Language. (3) Selected topics in Spanish linguistics. Topics may include a) history of the Spanish language; b) introduction to Spanish phonology and morphology; and c) Spanish dialectology. *May be repeated for credit with change of topic.*

SPAN 6003. Studies in Hispanic Culture and Civilization. (3) Selected topics on the civilization and culture of the Spanish-speaking world. Possible emphases include 1) the press in Spanish America; 2) song texts of the Hispanic world; 3) Spanish cinema; 4) Spain since Franco; 5) Hispanics in the United States. *May be repeated for credit with change of topic.*

SPAN 6005. Advanced Studies in Spanish Literature. (3) Study of selected works and writers from Spain. *May be repeated for credit with change of topic.*

SPAN 6007. Advanced Studies in Spanish American Literature. (3) Cross-listed Course(s): LTAM 6307. Study of selected works, writers, literary genres, periods, and schools from Spanish America. *May be repeated for credit with change of topic.*

SPAN 6201. Hispanic Language and Culture through Media. (3) In-depth study of contemporary Hispanic culture and language through media sources, including print, radio, film, Internet, and television. The course provides cultural exposure, and practice in written and oral communication, and training in the use of technology--assisted instruction. *May be repeated for credit with change of topic.*

SPAN 6902. Thesis. (1 to 6) Appropriate research and written exposition of that research. The proposed project, as well as the final product, will be approved by a committee of three faculty members appropriate to the topic, appointed by the Chair of the Department after consultation with the student, on the basis of a written proposal from the student. (A statement of recommendations and requirements for form and procedure is available in the office of the Department of Languages and Culture Studies.) *Graded on a Satisfactory Progress/Unsatisfactory Progress or Standard Letter Grade basis each term. May be repeated for credit up to 6 credit hours.*

Special Education (SPED)

SPED 5100. Introduction to Special Education. (3) Prerequisite(s): Admission to Teacher Education. Examines legislation and litigation that governs and/or influences services for individuals with disabilities. Scrutinizes the IEP process and investigates IEP objectives that reflect the general curriculum standards. Examines one's personal philosophy of education, which reflects the diversity of students with disabilities. Identifies services, networks, organizations, and publications that serve or are relevant to individuals with disabilities. Identifies and critiques instructional implications of published research.

SPED 5111. Issues in Early Intervention for Young Children with Disabilities. (3) Prerequisite(s): Admission to Teacher Education, and a GPA of 2.5 or above. Explores issues and evidence-based practices for young children with disabilities and their families in home, school, and community settings.

SPED 5112. Authentic Approaches to the Assessment of Young Children with Disabilities: Birth-Kindergarten. (3) Prerequisite(s): Admission to Teacher Education, GPA of at least 2.5, and SPED 5111. Develops competence in evaluation, design, implementation, and interpretation of culturally appropriate, interdisciplinary assessment approaches within the context of the young child's natural environments and in partnership with families that lead to appropriate intervention plans for children with disabilities. A field-based clinical assignment of approximately 20 hours is required.

SPED 5173. Diagnostic Assessment. (3) Prerequisite(s): SPED 5300, SPED 5370; Admission to Teacher Education. Provides an overview of the principles and practice of educational problem solving with an emphasis on formal/standardized assessment, including curriculum-based assessment and curriculum-based measurement; special education eligibility; linkages between assessment and instruction; and concepts in educational assessment of

students with exceptional learning needs (ELN). Topical paper required.

SPED 5175. Instructional Planning in Special Education. (3)

Prerequisite(s): Admission to Teacher Education. This introductory course addresses strategies for the development, implementation, and monitoring of Individualized Education Programs (IEPs) and related instructional planning for P-12 students with disabilities within the general curriculum (high incidence disabilities) or adapted curriculum (low incidence disabilities). Through this course, students are expected to demonstrate proficiency in using the general education curriculum to develop appropriate IEPs and lesson plans for instruction.

SPED 5200. Concepts and Principles of Behavior Analysis. (3)

Introduction to the basic principles by which humans learn social, academic, physical, and other skills. The primary goal is to provide students with a complete, accurate, and contemporary view of behavior analysis, and how this approach can be used to change socially significant behaviors for individuals, especially those with special needs.

SPED 5201. Science and Philosophy in Behavior Analysis. (3)

Prerequisite(s): SPED 5200. Introduction to the philosophical and scientific foundations underpinning behavior analytic perspectives and practices. Students acquire competencies related to the history of behavior analysis, behaviorism, radical behaviorism, and key characteristics of applied behavior analysis.

SPED 5202. Supervision and Consultation in Behavior

Analytic Programming. (3) Prerequisite(s): RSCH 7113, SPED 5200, SPED 5201, and SPED 6202. Explores competencies related to the supervision of staff, including consultation in schools, clinics, home, and other treatment environments, and collaboration with professionals across disciplines and families.

SPED 5203. Ethics, Compliance, and Professionalism in

Behavior Analysis. (3) Prerequisite(s): SPED 5200, SPED 5201, SPED 6202, and RSCH 7113. Introduction to the Professional and Ethical Compliance Code for Behavior Analysts. Students acquire competencies across a range of topics related to ethical practice by behavior analysts.

SPED 5210. Developmental Interventions for Young Children with Disabilities: Birth through Kindergarten. (3)

Prerequisite(s): Admission to Teacher Education; GPA of at least 2.5 overall; SPED 5111; and SPED 5112. Focuses on developing, facilitating, and evaluating incidental learning and play, and routines-based interventions with young children with disabilities and their families. A field-based clinical assignment of approximately 20 hours is required.

SPED 5211. Nature and Needs of Gifted Students. (3)

Examination of the historical and philosophical perspectives of education for gifted and talented learners with emphasis on answering the question "What is giftedness?" Issues explored in the course include identification procedures, instructional options, the nature of intelligence and creativity, laws/policies, psychological and emotional correlates of talent, and current research findings.

SPED 5270. Classroom Management. (3) Prerequisite(s):

Admission to Teacher Education. Equips students with the knowledge and skills of applied behavior analysis (ABA) as an approach for programming effective interventions for children and youths with disabilities. It focuses specifically on "positive behavior support" (PBS), a research-validated approach to interventions designed to prevent problem behavior, encourage environmental management, and promote students' positive and appropriate behavior. Prepares students to conduct a functional behavioral assessment (FBA) in order to more efficiently and effectively identify the interventions to address the students' behavioral needs. The desired outcomes of this course are for students to have a basic understanding of ABA, FBA, and PBS as well as to apply these principles in a classroom setting for students with disabilities.

SPED 5271. Systematic Instruction. (3) Prerequisite(s):

Admission to Teacher Education and Special Education Graduate Certificate Program; SPED 5100; SPED 5173; and SPED 5270. Principles and procedures used to program instruction for persons with severe disabilities are presented and evaluated as to their effectiveness. Students are required to design and implement an instructional program for students with severe disabilities.

SPED 5272. Teaching Mathematics to Learners with Special Needs. (3) Prerequisite(s): Admission to Teacher

Education and Special Education Graduate Certificate Program; SPED 5100; SPED 5173; and SPED 5175. Effective teaching strategies and materials in math for learners with special needs for teacher licensure in Special Education: General Curriculum as stipulated by the North Carolina Department of Public Instruction. A 12-hour field-based clinical experience is a required component of the course. Assessment and application of instructional techniques are included.

SPED 5274. General Curriculum Access and Adaptations. (3) Prerequisite(s): Admission to Teacher Education and

Special Education Graduate Certificate Program; SPED 5173, SPED 5300, and SPED 5370. Provides strategies for developing curricular priorities for students who need adaptations to the general curriculum including ways to link to state standards in reading, math, writing, science, and other content areas. Supports teachers seeking licensure in Special Education: Adapted Curriculum

(NCDPI). A directed field experience is a required component (approximately 12 hours).

SPED 5275. Teaching Reading to Elementary Learners with Special Needs. (3) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate Program; SPED 5100; SPED 5173; and SPED 5175. Effective prevention and intervention strategies for addressing the needs of elementary students with disabilities and diverse learning needs. Assessment and application of instructional strategies are included in the course. A semester long 12-hour field experience is a required component.

SPED 5276. Teaching Reading to Middle and Secondary Learners with Special Needs. (3) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate Program, SPED 5100, SPED 5173, SPED 5175, and SPED 5270. Provides effective remedial and intervention strategies for addressing the needs of middle and secondary students with disabilities and diverse learning needs. Assessment and application of instructional strategies are included in the course. Clinical field experience hours required.

SPED 5277. Teaching Written Expression to Learners with Special Needs. (3) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate Program; SPED 5100; SPED 5173; and SPED 5175. Provides students with effective teaching strategies and materials in written expression to learners with special needs. A 12-hour field experience is a required component of the course. The field experience includes assessment and application of instructional techniques with students identified as receiving special education services. Designed to address core and specific competencies in teaching written expression to students with special needs for teacher licensure in Special Education: General Curriculum as stipulated by the North Carolina Department of Public Instruction.

SPED 5278. Instructional Planning for Students in the Adapted Curriculum. (3) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate Program; SPED 5100; SPED 5173; and SPED 5270. Addresses strategies for the development, implementation, and monitoring of Individualized Education Programs (IEPs) and related instructional planning for P-12 students with disabilities within the adapted curriculum (low incidence disabilities). Through this course, students are expected to demonstrate proficiency in developing appropriate IEPs. Additionally, this course provides strategies for lesson planning that include collaborative instruction, Universal Design for Learning, and instructionally relevant use of computer-based technology. Implementation of at least one lesson plan is included. A 10-hour field experience is a required component.

SPED 5279. Content-Area Instruction for Students with Special Needs. (3) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate program; SPED 5100; SPED 5173; SPED 5175; SPED 5270; SPED 5272; SPED 5275 or SPED 5276; and SPED 5277. Provides strategies for collaborative instruction, instructionally relevant use of computer-based technology, and strategic instruction to improve access of students with disabilities in the general curriculum with an emphasis on content-area instruction at the middle and secondary levels: English, science, social studies, and mathematics. Application of instructional strategies are included in the course. A semester long 10-hour field experience is a required component.

SPED 5280. Multiple Disabilities. (3) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate program; SPED 5100; SPED 5173; and SPED 5270. Describes various secondary disabling conditions that sometimes occur in conjunction with intellectual disability such as physical disabilities, sensory disabilities, and other health impairments. Assessment, instructional methods and procedures, and collaborative service delivery with related services personnel are studied. A field-based clinical assignment of approximately 12 hours is required.

SPED 5300. Lifespan Development for Exceptional Individuals. (3) Prerequisite(s): Admission to COED Teacher Education program. Topics in special education (SPED) that support concepts and skills for early special education professionals and others who serve exceptional individuals. Examines legislation and litigation that govern and/or influence services for exceptional individuals. Various areas of exceptionality are addressed with applications for service delivery and programming. Candidates study student and family transitions from early childhood to post-secondary options. Identifies services, networks, organizations, and publications that serve or are relevant to exceptional individuals.

SPED 5316. Transition Planning and Service Delivery. (3) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate Program; SPED 5100; and SPED 5173. Methods and procedures used in preparing students with disabilities for post school adjustment including employment, leisure, residential, and continuing educational opportunities are studied. A field-based clinical assignment is required.

SPED 5370. Multi-tiered Behavioral Supports. (3) Equips students with the knowledge and skills to access, plan, and evaluate positive behavioral and cultural supports based on students' Individualized Education Program goals and objectives. The course prepares students to design a positive classroom environment as well as provide individual support for students with behavioral challenges

while considering the unique experiences of students from varied settings.

SPED 5371. Person-Centered Planning for Students with Extensive Support Needs. (3) Prerequisite(s): SPED 6225, SPED 6390, and admission to the M.A.T. in Special Education program. Provides content and context related to the development of opportunities and experiences in the least restrictive environment for students who have extensive support needs. Topics include: developing supports within school and community environments and with a range of team members, arranging peer supports, working with families, and capitalizing on post-school environments and experiences. A major component of the course is engaging in a person-centered planning process to develop a supports plan designed to promote meaningful experiences in the most natural environments for an individual with extensive support needs. The clinical experience may take place in either a school or community setting.

SPED 5372. Planning Mathematics Instruction for Students with Exceptional Needs. (3) Prerequisite(s): SPED 5173, SPED 5300, and SPED 5370, and admission to COED Teacher Education program. Provides strategies for (a) assessing students' mathematics performance, (b) applying mathematics standards, student needs, strengths, and weaknesses, and IEP goals to mathematics lesson planning, (c) utilizing evidence- and research-based instructional practices, and (d) integrating technology into lesson plans for teacher licensure in Special Education: General Curriculum (NCDPI). A directed field experience is a required component (approximately 12 hours).

SPED 5375. Foundations of Literacy for Students with Disabilities. (3) Prerequisite(s): SPED 5173, SPED 5300, and SPED 5370. Provides effective beginning prevention and intervention strategies for addressing the literacy needs of students with disabilities and varied learning needs. Also includes assessment and application of instructional strategies. Supports teachers seeking licensure in Special Education: General Curriculum (NCDPI). A directed field experience is a required component (approximately 12 hours).

SPED 5377. Advanced Literacy for Students with Disabilities. (3) Prerequisite(s): Admission to the M.A.T. in Special Education program. Effective advanced prevention and intervention strategies for addressing the literacy needs of students with disabilities and varied learning needs. Assessment and application of instructional strategies are included. A field experience is a required component.

SPED 5379. Disability Supports in Content-Area Classrooms. (2) Prerequisite(s): Admission to the M.A.T. in Special Education program. Provides an in-depth

knowledge of the general curriculum standards and curricular expectations impacting the education of students with special needs in the least restrictive classroom. The course provides strategies for collaborative instruction, academic language development, considerations of students' backgrounds and experiences, instructionally relevant use of computer-based technology, content enhancement, and strategic instruction to improve access of students with disabilities included in content-area (English, science, social studies, and mathematics) instruction at the intermediate, middle and secondary levels (grades 4-12). Application of instructional strategies is included in the course and field experience is required.

SPED 5380. Multiple Disabilities and Systematic Instruction. (3) Prerequisite(s): SPED 5173, SPED 5300, and SPED 5370. Describes various secondary conditions that sometimes occur in conjunction with intellectual disability such as physical disabilities, sensory disabilities, and other health impairments. Topics include: assessment, instructional methods and procedures, and collaborative service delivery with related services personnel. Supports teachers seeking licensure in Special Education: Adapted Curriculum (NCDPI). A field-based clinical assignment in which students design and implement an instructional program for a student with multiple disabilities is required (approximately 12 hours).

SPED 5400. Practicum: Integrated Instructional Applications in Special Education. (3) Prerequisite(s): *Adapted Track*: SPED 5300, SPED 5370, SPED 5173, SPED 5274, SPED 5380; *General Track*: SPED 5300, SPED 5370, SPED 5173, SPED 5372, SPED 5375. Candidates develop and apply knowledge of varied learner needs by planning and implementing lessons that align to state standards in academic content areas designed to meet the individual needs of students with disabilities. Additionally, candidates analyze student outcome data and make instructional decisions for subsequent lessons. Candidates receive extensive coaching and feedback of instructional and behavioral strategies within the course and school site classroom. Candidates are expected to apply feedback during instruction (rehearsal and clinical application). This is a clinical intensive course requiring extensive classroom experience.

SPED 6000. Topics in Special Education. (1 to 6) Prerequisite(s): Admission to Teacher Education and Special Education Graduate Certificate Program. May include classroom and/or clinical experiences in the content area. *May be repeated for credit with permission of department.*

SPED 6111. Advanced Issues in Early Intervention/Early Childhood Special Education (EI/ECSE). (3) In-depth exploration of issues and evidence-based practices for young children and their families in home, school, and

community settings. Emphasis on current research, developmental/educational implications of disabilities, and leadership in early intervention and early childhood special education.

SPED 6115. Introduction to Autism Spectrum Disorder. (3)

Prerequisite(s): Admission to the M.A.T. in Special Education program, admission to the M.Ed. in Special Education and Child Development Program, admission to the Graduate Certificate in Autism Spectrum Disorder program, or being admitted as a post-baccalaureate student. An introduction to the history, and cultural and individual impacts of autism spectrum disorder (ASD), and systems of support for individuals with ASD and their families. Students learn to distinguish between research-based and fad or pseudoscientific information related to ASD and interventions for this population.

SPED 6124. Methods of Instructing Gifted Students. (3) Pre-

or Corequisite(s): SPED 5211. An introduction to the basic skills necessary to plan, implement, and evaluate instructional procedures that facilitate learning by gifted students. Specific theories discussed include those by Bloom, Kaplan, Parnes, Renzulli, and VanTassel-Baska.

SPED 6161. Social and Emotional Needs of Gifted Students. (3)

An overview of current theory and practice in understanding gifted students' social and emotional development. Topics range from the social and emotional needs of the general population of gifted students to the unique needs of specific sub-groups of gifted students (e.g., gifted girls, gifted and learning disabled, gifted minority students).

SPED 6202. Behavioral Assessment. (3) Prerequisite(s):

Admission to the M.A.T. (Phase II) or M.Ed. in Special Education program. Advanced theoretical context, including applied behavior analysis, functional assessments, and positive behavioral supports, and related applied strategies necessary to effectively address the classroom behaviors of individuals or groups of students. A field-based assignment of approximately 15 hours is required.

SPED 6224. Adapting Curriculum Materials and Classroom Differentiation. (3) Pre- or Corequisite(s): SPED 5211, SPED

6124, and SPED 6161. Students study methods of making accommodations to meet the gifted student's needs in the regular classroom. Topics include: differentiated lesson plans based on national and state standards as well as methods of adapting the learning environment to support multi-level learning.

SPED 6225. Behavior Analytic Intervention in

Communication. (3) Prerequisite(s): A bachelor's degree from an accredited college or university in education or related field of study. Provides a behavior analytic lens, rooted in Skinner's analysis of verbal behavior, through

which to view communication development and intervention. Students learn to conduct behavioral communication assessments and implement research-based interventions for teaching early learning and communication skills to individuals with autism spectrum disorder (ASD) and other disabilities. In addition, students learn how to select and design augmentative and alternative communication systems for use with non-vocal students and to collaborate with families and other professionals to facilitate the design of high quality programming.

SPED 6241. Advanced Curriculum for Gifted Students. (3)

Models of curriculum design for academically or intellectually gifted students. Emphasis on integrating philosophy of teacher, school, and community with child characteristics to create the appropriate course of study in a variety of school settings.

SPED 6242. Enhancing Communication and Supporting Behavior in Early Childhood Settings. (3) Pre- or

Corequisite(s): CHFD 6102 and CHFD 6210. Provides professionals with in-depth knowledge regarding theories, evidence-based strategies, and best practices to provide effective social-communication interventions and addressing challenging behaviors of young children across a variety of settings. IECMH Endorsement: This course partially addresses Competency Guidelines® and Infant and Early Childhood Mental Health Endorsement®.

SPED 6270. Gifted Assessment and Program Evaluation. (3)

Prerequisite(s): SPED 6161 and SPED 6224, or permission of instructor. This advanced course introduces the theory and practice behind structuring programs for gifted students, from legal mandates to assessment considerations, program design, and evaluation of students and programs. Evaluation of gifted programming provides experience applying the frameworks presented in current North Carolina and national standards.

SPED 6272. Program Design and Development for Autism Spectrum Disorders. (3) Prerequisite(s): SPED 6115 and SPED

6225. Prepares students with the technical skills necessary to conduct formal assessments, implement research-based interventions, and evaluate outcomes for individuals with autism spectrum disorders. Identify methods for planning systematic instruction based on learner characteristics based on previous and on-going assessment. Gain knowledge of home environments, family interventions and general curriculum access with an emphasis on appropriate strategies, materials, and supports in program design and development that facilitate the success of students with autism spectrum disorders across the lifespan.

SPED 6277. Program Assessment for Autism Spectrum Disorders. (3) Prerequisite(s): SPED 6115 and SPED 6225.

Prepares students to assess the effectiveness of interventions for students with autism spectrum disorders in accordance to researched-based practices and promising practices. Interpret and apply individualized educational program assessment data to drive program recommendations, services, appropriate interventions, and IEP development for students with autism spectrum disorders.

SPED 6335. Evidence-Based Practices for Learners with Autism Spectrum Disorder. (3) Prerequisite(s): SPED 6115. Prepares students with the skills necessary to identify, implement, and evaluate the effectiveness of evidence-based practices for individuals with autism spectrum disorder. This course prepares students to recognize factors that influence how special education professionals make decisions regarding what interventions and strategies to use, to implement an evidence-based practice to meet the needs of an individual with autism spectrum disorder and interpret and apply behavioral observation data, and to evaluate how evidence-based practices may best meet the complex needs of individuals with autism spectrum disorder across the lifespan.

SPED 6350. Young Children with Disabilities and their Families: Interdisciplinary Collaboration. (3) Pre- or Corequisite(s): CHFD 6102 and CHFD 6220. Explores issues and evidenced based practices specific to forming family-professional partnerships and collaborating across disciplines (e.g., early childhood education, occupational therapy, physical therapy, speech and language therapy, social work, nursing, public health, education) to address the complex needs of young children with disabilities (or at-risk of developmental delays) and their families in natural and/or least restrictive environments (e.g., home, school, community settings, hospitals). IECMH Endorsement: This course partially addresses Competency Guidelines® and Infant and Early Childhood Mental Health Endorsement®.

SPED 6390. Collaboration and Transition-Focused Education. (2) Prerequisite(s): Admission to the M.A.T. in Special Education program. Provides special educators with advanced knowledge relating to: (a) the roles of parents, paraeducators, administrators, other professionals, and students on multi-disciplinary teams; (b) initiatives in building the least restrictive program; and (c) the array of services available to children with disabilities, in preparation for post-school success. The course enhances skills to: (a) effectively communicate for collaboration; (b) promote family involvement, including engagement of families from varied backgrounds; and (c) collaboratively plan and deliver instruction in school or community settings.

SPED 6475. Internship/Seminar: Special Education K-12 - General Curriculum. (3 to 6) Prerequisite(s): Admission to Special Education Graduate Certificate Program and grade

of C or higher in all licensure courses; Application for SPED internship. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting. Includes seminars. Participating students pay a course registration fee for edTPA portfolio assessment. *Graded on a Pass/Unsatisfactory basis.*

SPED 6476. Internship/Seminar: Special Education K-12-Adapted Curriculum. (3 to 6) Prerequisite(s): Admission to Special Education Graduate Certificate Program and grade of C or higher in all licensure courses; Application for internship. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting. Includes seminars. Participating students pay a course registration fee for edTPA portfolio assessment. *Graded on a Pass/Unsatisfactory basis.*

SPED 6637. Theory and Development of Creativity. (3) Prerequisite(s): SPED 6161 and SPED 6224, or approval of instructor. Provides an exploration of the concept of creativity: its components, its measurement, and its application to education. Topics discussed in class range from the theoretical (what is creativity? what does it look like?) to the practical (what activities can be used to develop creative behaviors in the classroom setting?). Includes opportunities to prepare materials to be used with small groups of children.

SPED 6690. Consultation and Collaboration. (2) Prerequisite(s): Admission to the M.A.T. (Phase II) in Special Education program. Special educators must be able to build effective partnerships with families, general educators, paraeducators, and related service professionals in order to assure comprehensive and quality programs for children with disabilities. Provides special educators with knowledge relating to the role of parents, paraeducators, administrators, other professionals, and students on multi-disciplinary teams, initiatives in building inclusive programs, and the array of services available to children with disabilities. Provides skills in effective communication; promoting family involvement, including families who are culturally diverse; team planning; collaborative instruction; and leadership. Enhances the view of special educators as specialists and a resource to

colleagues for instruction, inclusion, transition, and collaboration with outside agencies.

SPED 6691. Seminar in Professional and Leadership

Development. (1) Prerequisite(s): Admission to the M.A.T. in Special Education program; SPED 6202 and RSCH 7113. Pre- or Corequisite(s): SPED 6690. Designed to support graduate students in the design, implementation, and write up of their Data-based Decision Project, required for M.A.T. in Special Education candidates. This project involves the candidate implementing (in a school setting) an academic or behavioral intervention with one or more students using a single subject research methodological design and support/mentor a colleague to implement a similar intervention with other students. The resulting product serves as the capstone project for the M.A.T.

SPED 6692 Research Proposal. (2) Prerequisite(s): An "A" level special education teaching license, admission to the M.Ed. in Special Education, SPED 6202 and RSCH 7113. Provides evidence that a candidate can conceptualize and design a single subject research study and supports the development of the capstone project required for M.Ed. in Special Education candidates. Candidates must complete the University's Institutional Review Board (IRB) Research with Human Subjects online tutorial, submit a research protocol application, and receive IRB approval prior to implementing the study. This course is not a traditional, instructor-taught course sequence, but is directed by the candidate's academic advisor and supported by another faculty committee member. (*Fall, Spring*)

SPED 6693. Research Implementation. (2) Prerequisite(s): SPED 6692. Provides evidence that a candidate can implement a single subject research study and supports the development of the capstone project required for M.Ed. candidates in special education. This course is not a traditional, instructor-taught course sequence, but is directed by the candidate's academic advisor and supported by another faculty committee member.

SPED 6694. Research Dissemination and Leadership. (2) Prerequisite(s): SPED 6693. Provides evidence that candidates develop necessary skills and dispositions to assume the roles and responsibilities of collaborative leaders in schools and communities; demonstrate leadership in their classrooms, school, and professional organizations; and advocate for students and effective educational practices and policies. Candidates produce a written report of a research study and deliver a workshop for their school colleagues. The workshop includes a report of the research results and implications for addressing a problem or issue in the school. This course is not a traditional, instructor-taught course sequence, but is directed by the candidate's academic advisor and supported by another faculty committee member.

SPED 6695. Research Proposal in AIG. (3) Provides evidence that a candidate can conceptualize and design a research study using a recognized research design, and it supports the development of the capstone research project required for M.Ed. candidates in AIG. Candidates complete the University's Institutional Review Board (IRB) Research with Human Subjects online tutorial, develop and submit a research protocol application, and submit their application for IRB approval prior to implementing the study in SPED 6696.

SPED 6696. Research Implementation in AIG. (3)

Candidates implement a research study using a recognized research design that they have designed in SPED 6695 and will produce a written report to disseminate their findings to stakeholders. Allows students to complete the capstone project requirement for M.Ed. candidates in the area of Academically or Intellectually Gifted.

SPED 6800. Individual Study in Special Education. (1 to 6)

Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

SPED 8272. Research Implementation in Special Education.

(3) The process of conducting applied research in special education. Students design and implement a research study in collaboration with a faculty member.

SPED 8273. Grant Writing in Special Education. (3)

SPED 8273 is experimental and centered in conceptualizing and developing applications for federal, state, local, and private grant funding for research and innovation efforts. A strong emphasis will be placed on applications for federal and state funding with a secondary focus on applications for corporate and private foundation funds.

SPED 8277. Professional Writing in Special Education. (3)

Introduces the forms of professional writing expected of leaders in special education. Emphasis is placed on critical thinking, practice writing, and peer assessment.

SPED 8474. Supervision of Student Teachers in Special Education. (3)

An internship experience. The course includes seminar sessions and concentrated practice in supervision of special education student teachers under direct faculty supervision.

SPED 8475. University Co-Teaching in Special Education and Child Development: Level I. (3)

Issues and concepts in teaching adults and preparing special educators are applied in the university teaching experience. This course supports doctoral students as they experience a graduated co-teaching process ultimately resulting in assumption of full college teaching responsibilities for university courses in special education topics. *May only be repeated by*

students seeking the college teaching specialization within the revised 4-year degree program, who might repeat it in working with an additional course to broaden their teaching experience.

SPED 8476. Doctoral Internship in Special Education. (3 to 6) Supplements students' specialty areas through leadership experiences in a field related to or impacting special education (i.e., government, school district, agency). Provides students with an opportunity to explore their leadership skills in a new role within a field-based setting with the supervision of a mentor. *May be repeated for credit up to 6 credit hours.*

SPED 8478. University Co-Teaching in Special Education and Child Development: Level II. (3) Prerequisite(s): SPED 8475. Issues and concepts in teaching adults and preparing special educators are applied in the university teaching experience. This course supports doctoral students as they experience a progressively responsible co-teaching process ultimately resulting in assumption of full teaching responsibilities for university courses in special education and related areas. *The revised version would only be repeated by students seeking the college teaching specialization within the revised 4-year degree program, who might repeat it in working with an additional course to broaden their teaching experience.*

SPED 8479. University Co-Teaching in Special Education and Child Development: Level III. (3) Prerequisite(s): SPED 8475, SPED 8478. Issues and concepts in teaching adults and preparing special educators are applied in the university teaching experience. This third course supports doctoral students as they complete a graduated co-teaching process ultimately resulting in competency in the full array of college teaching responsibilities for university courses in special education and related areas. *May be repeated for credit up to 12 credit hours. This is to allow for additional teaching experience across different content areas and instructional levels, for those pursuing the college teaching specialization.*

SPED 8671. Doctoral Seminar in Special Education Research. (3) An intensive overview of the major research designs used in Special Education including group designs, single subject designs, survey research, qualitative research, and program evaluation. Introduces students to the research interests of the faculty.

SPED 8672. Doctoral Seminar in Leadership in Special Education. (3) An intense review of the history, landmark events, professional organizations, and seminal articles in the field of special education and related disciplines. Also includes substantial coverage of federal and state policies, IDEA, and special education law. Prepares students to build professional leadership skills in areas such as time

management, systematic planning, team leadership, and communication.

SPED 8673. Doctoral Seminar in Collaboration. (3) Advanced exploration of collaboration with educators, families, and others who support individuals with disabilities. This course emphasizes the significance of understanding education and family engagement across various family structures, while developing effective and informed collaboration methods. Students will gain practical experience in applying a range of instructional strategies within school, community, and college settings. Field-based projects are required.

SPED 8674. Doctoral Seminar in Teaching in Special Education. (3) Presents techniques used in the supervision and instruction of adult learners in college or school system settings. Also provides an intensive overview of current, empirically supported strategies for the instruction of learners across disability areas as an important knowledge base for leadership and college teaching roles in special education.

SPED 8675. Special Education Doctoral Seminar in Applied Behavioral Analysis. (3) Advanced study of concepts, principles, and strategies in applied behavioral analysis. Prepares students in the conceptual and technical skills necessary to change socially significant behavior.

SPED 8699. Dissertation Proposal Seminar in Special Education. (3) Identification and definition of a research area and development of a proposal outline for an original research study appropriate for the dissertation requirement. *Enrollment limited to PhD students in Special Education who have passed Portfolio 2.*

SPED 8800. Independent Study in Special Education. (1 to 6) Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

SPED 8920. Leadership in Special Education Research. (1) Prerequisite(s): SPED 8272, SPED 8277, SPED 8671, RSCH 8110, RSCH 8111, RSCH 8113; Good standing in program. The Leadership in Special Education Research course gives students an opportunity to lead a team of faculty/students to (a) conceptualize, plan, and implement a research study; (b) analyze results/findings; and (c) disseminate results/findings. This course will provide leadership in research opportunities that will (a) prepare students for their dissertations, and (b) help them develop a line of research.

SPED 8999. Dissertation Credits. (3, 6, or 9) Development, implementation, and evaluation of an original research study that addresses the needs of exceptional learners.

Graded on a Satisfactory Progress/Unsatisfactory Progress basis each term.

Statistics (STAT)

STAT 5110. Applied Regression Analysis. (3) Prerequisite(s): MATH 2164; and STAT 2122, STAT 3128, or equivalent; or permission of department. Theoretical and practical training in statistical modeling with particular emphasis on the application of linear regression and multivariate statistical analysis. The basic fundamentals and statistical inference techniques associated with regression models are introduced. Students also learn how to apply the statistical techniques to extract information from data generated in various application areas using statistical software. Topics include: linear regression, model adequacy checking and diagnostics, generalized linear regression, and multivariate statistical analysis.

STAT 5123. Applied Statistics I. (3) Prerequisite(s): MATH 2164 with a grade of C or above or permission of the department. Focuses on linear regression. Topics include: parameter estimation, statistical inference, model diagnostics, transformations, leverages and influential points, multicollinearity, dimension reduction techniques, variable selection, categorical predictors, logistic regression.

STAT 5124. Applied Statistics II. (3) Prerequisite(s): STAT 5123 or permission of the department. Regression with categorical predictors, single and multi-factor studies, analysis of covariance (ANCOVA), random effects, randomized block and randomized complete block designs, split-plot designs, and Latin squares.

STAT 5227. Loss Models and Applications. (3) Cross-listed Course(s): STAT 4227. Prerequisite(s): MATH 2241; and MATH 3122 or STAT 3122; or approval of department. Review of the key features of insurance and reinsurance; severity, frequency, and aggregate loss models; parametric estimation; model selection.

STAT 6108. Probability and Statistics for Mathematics Teachers. (3) Cross-listed Course(s): MATH 6108. Prerequisite(s): Admission into the M.S. in Mathematics with Concentration in Mathematics Education program. Topics from probability and statistics appropriate for mathematics teachers. Topics in probability include: discrete and continuous random variables, probability distributions, sums and functions of random variables, the law of large numbers, and the central limit theorem. Topics in statistics include: sample mean and variance, estimating distributions, correlation, regression, and hypothesis testing.

STAT 6113. Cross-Section and Time-Series Econometrics. (3) Cross-listed Course(s): ECON 6113. Prerequisite(s):

permission of department. Introduces the advanced study of the theory and application of statistics to economic problems. Topics include: derivation of the least-squares estimator; methods with which to detect and correct for potential problems with the classical regression model; maximum likelihood estimation; instrumental variables regression; the problems with multicollinearity, heteroscedasticity, and autocorrelation; introduction to the time-series estimation, including ARIMA models and basic forecasting tools.

STAT 6115. Statistical Learning with Big Data. (3) Cross-listed Course(s): DSBA 6115. Prerequisite(s): ECON 6113, STAT 5110, STAT 5123, STAT 6113, or permission of department. A survey of major statistical learning concepts and methods for big data analysis, including both supervised and unsupervised learning such as resampling methods, support vector machines, model selection and regularization, tree-based methods and ensembles, and statistical graphics. Students learn how and when to apply statistical learning techniques, their comparative strengths and weaknesses, and how to critically evaluate the performance of learning algorithms in case studies in financial investment, gene identification, and feature selection in high-dimensional spaces.

STAT 6127. Introduction to Biostatistics. (3) Prerequisite(s): MATH 1100 and STAT 1221 or permission of department. Descriptive statistics and exploratory data analysis; basic probability models and the concept of random variables; point and interval estimation; hypothesis testing (one- and two-sample problems); simple linear regression and ANOVA; selection of appropriate methods for analysis; development of skills to conduct analysis of data; development of the capability to present the results of a study in scientific language.

STAT 6228. Short-Term Actuarial Mathematics. (3) Prerequisite(s): MATH 4228 or MATH 5228, or permission of the department. A preparatory course for Actuarial Exam STAM. It covers severity models, frequency models, aggregate models, coverage modifications, risk measures, construction and selection of parametric models, credibility, insurance and reinsurance coverages, pricing and reserving for short-term insurance coverages.

STAT 7027. Topics in Statistics. (3) Prerequisite(s): Permission of department. Topics of current interest in statistics and/or applied statistics. *May be repeated for credit with permission of department.*

STAT 7116. Theory of Statistics I. (3) Prerequisite(s): MATH 2241 and STAT 3123, or permission of the department. An introduction to calculus-based probability. Topics include: axioms of probability, conditional probability, discrete and continuous random variables, expectation, transforms of

random variables, multivariate distributions, law of large numbers, central limit theorem, asymptotic theory.

STAT 7117. Theory of Statistics II. (3) Prerequisite(s): STAT 7116 or STAT 8116, or permission of department. Cross-listed Course(s): STAT 8117. This course covers the topics: Generating of a random sample, principles of data reduction, point estimation and efficiency, hypothesis testing and most powerful tests, interval estimation, asymptotic evaluations.

STAT 7122. Advanced Statistics I. (3) Prerequisite(s): MATH 7143 and STAT 7117 or permission of department. A survey of frequently used statistical techniques selected from: estimation theory and hypothesis testing, parametric goodness-of-fit criterion and tests for independence, measures of association, regression techniques, multi-sample inferential techniques, Bayes and minimax estimation, admissibility, minimax property.

STAT 7123. Advanced Statistics II. (3) Prerequisite(s): STAT 7122 or permission of department. Hypothesis testing, Neyman-Pearson Lemma, UMP tests, UMP unbiased tests, monotone likelihood ratio families of distributions, UMP invariant tests. Confidence bounds and regions, uniformly most accurate bounds, regression models, least squares estimates, normal equations, Gauss-Markov theorem. Large sample behavior of methods of moments estimates, maximum likelihood estimates, likelihood ratio tests, Chi-square tests, approximate confidence regions for large samples.

STAT 7127. Linear Statistical Models. (3) Prerequisite(s): MATH 2164 and MATH 3123, or permission of department. A selection of topics from the following list: distribution and quadratic forms, regression, dummy variables, models not of full rank, the two-way crossed classification, time series.

STAT 7133. Multivariate Analysis. (3) Prerequisite(s): STAT 7116 and STAT 7117, or permission of department. Multivariate distributions. Inference for the multivariate normal model. Further topics from the following: principal components, factor analysis, multidimensional scaling, canonical correlation, discriminant analysis, cluster analysis, multivariate linear models, special topics.

STAT 7135. Statistical Computation. (3) Cross-listed Course(s): STAT 8135. Prerequisite(s): STAT 7116, STAT 7117, or permission of the department. A survey of modern methods of computational statistics used for both theoretical research and practical applications, including resampling methods, Markov chain Monte Carlo simulations, numerical optimization, parallel computation, etc. Statistical computational methodology is first presented and then implemented in the R software. Each

method is illustrated by using either real application or simulated data sets as examples. Students learn how to conduct simulation and real data analysis, how to make efficient codes in R for their research, and how to apply each method in practice.

STAT 7137. Survival Analysis. (3) Cross-listed Course(s): STAT 8137. Prerequisite(s): STAT 7116 and STAT 7117, or permission of department. Introduction to statistical models, methods, and theories in the analysis of event history data. Topics include: failure time data and censoring, competing risks and multistage models, one-sample nonparametric estimation, k-sample hypothesis tests, the likelihood constructions for failure time data, and semi-parametric models including the Cox proportional hazards model and Aalen's additive hazards model. Also examines some graphical diagnosis methods and goodness-of-fit tests, as well as counting processes and martingales to study the theoretical properties of various estimators and hypothesis tests. Statistical software in R is used for data analysis to demonstrate the methods.

STAT 7139. Time Series Analysis. (3) Cross-listed Course(s): STAT 8139. Prerequisite(s): STAT 7127, STAT 8127, or permission of department. Provides an extensive survey of the theory, methods, and applications of time series analysis. Topics include: stationary and non-stationary models, time domain and frequency domain methods, models for estimation and inference in time series, etc.

STAT 7490. Industrial Internship. (0 to 6) Prerequisite(s): Completion of 6 credit hours of MATH/STAT/OPRS graduate courses and permission of department. Full- or part-time academic year or summer internship in mathematics and/or statistics complementary to the student's major course of study and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by the department's Graduate Program Director. Requires a mid-term report and a final report to be graded by the supervising faculty. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit up to 6 credit hours. Credit hours gained from the internship may not be counted toward the courses leading to advancement to candidacy.*

STAT 7891. Independent Study in Statistics. (1 to 3) Prerequisite(s): Permission of department. Faculty-directed independent study of topics not provided by other course offerings and/or to examine, extend, and enrich extant knowledge in statistics through supervised individual study. *May be repeated for credit with change of topic.*

STAT 7892. Directed Project in Statistics. (1 to 3) Prerequisite(s): Permission of department. The directed independent project may be original work, work of an expository nature, or the mathematical/statistical

formulation and solution of a particular problem of statistical significance. The project may also involve a specific application of techniques identified in the literature or studied in other courses. The project must be defended in an oral presentation. *May be repeated for credit up to 6 credit hours.*

STAT 8027. Topics in Statistics. (3) Prerequisite(s): Permission of department. Topics of current interest in statistics and/or applied statistics. *May be repeated for credit with permission of department.*

STAT 8116. Theory of Statistics I. (3) Prerequisite(s): MATH 2241 and STAT 3123, or permission of the department. Cross-listed Course(s): STAT 7116. An introduction to calculus-based probability. Topics include: axioms of probability, conditional probability, discrete and continuous random variables, expectation, transforms of random variables, multivariate distributions, law of large numbers, central limit theorem, asymptotic theory.

STAT 8117. Theory of Statistics II. (3) Cross-listed Course(s): STAT 7117. This course covers the topics: Generating of a random sample, principles of data reduction, point estimation and efficiency, hypothesis testing and most powerful tests, interval estimation, asymptotic evaluations.

STAT 8122. Advanced Statistics I. (3) Prerequisite(s): MATH 8143 and STAT 7117, or permission of department. A survey of frequently used statistical techniques selected from: estimation theory and hypothesis testing, parametric goodness-of-fit criterion and tests for independence, measures of association, regression techniques, multi-sample inferential techniques, Bayes and minimax estimation, admissibility, and minimax property.

STAT 8123. Advanced Statistics II. (3) Prerequisite(s): STAT 8122 or permission of department. Hypothesis testing, Neyman-Pearson Lemma, UMP tests, UMP unbiased tests, monotone likelihood ratio families of distributions, UMP invariant tests. Confidence bounds and regions, uniformly most accurate bounds, regression models, least squares estimates, normal equations, Gauss-Markov theorem. Large sample behavior of methods of moments estimates, maximum likelihood estimates, likelihood ratio tests, Chi-square tests, approximate confidence regions for large samples.

STAT 8127. Linear Statistical Models. (3) Prerequisite(s): MATH 2164 and MATH 3123, or permission of department. A selection of topics from the following list: distribution and quadratic forms, regression, dummy variables, models not of full rank, the two-way crossed classification, and time series.

STAT 8133. Multivariate Analysis. (3) Prerequisite(s): STAT 7116 and STAT 7117, or permission of department.

Multivariate distributions. Inference for the multivariate normal model. Further topics from the following: principal components, factor analysis, multidimensional scaling, canonical correlation, discriminant analysis, cluster analysis, multivariate linear models, and other special topics.

STAT 8135. Statistical Computation. (3) Cross-listed Course(s): STAT 7135. A survey of modern methods of computational statistics used for both theoretical research and practical applications, including resampling methods, Markov chain Monte Carlo simulations, numerical optimization, parallel computation, etc. Statistical computational methodology is first presented and then implemented in the R software. Each method is illustrated by using either real application or simulated data sets as examples. Students learn how to conduct simulation and real data analysis, how to make efficient codes in R for their research, and how to apply each method in practice.

STAT 8137. Survival Analysis. (3) Cross-listed Course(s): STAT 7137. Prerequisite(s): STAT 7116 and STAT 7117, or permission of department. Introduction to statistical models, methods, and theories in the analysis of event history data. Topics include: failure time data and censoring, competing risks and multistage models, one-sample nonparametric estimation, k-sample hypothesis tests, the likelihood constructions for failure time data, and semi-parametric models including the Cox proportional hazards model and Aalen's additive hazards model. Also examines some graphical diagnosis methods and goodness-of-fit tests, as well as counting processes and martingales to study the theoretical properties of various estimators and hypothesis tests. Statistical software in R is used for data analysis to demonstrate the methods.

STAT 8139. Time Series Analysis. (3) Cross-listed Course(s): STAT 7139. Prerequisite(s): STAT 7127, STAT 8127, or permission of department. Provides an extensive survey of the theory, methods, and applications of time series analysis. Topics include: stationary and non-stationary models, time domain and frequency domain methods, models for estimation and inference in time series, etc.

STAT 8490. Industrial Internship. (0 to 6) Prerequisite(s): Completion of 6 credit hours of MATH/STAT/OPRS graduate courses and permission of department. Full- or part-time academic year or summer internship in mathematics and/or statistics complementary to the student's major course of study and designed to allow theoretical and course-based practical learning to be applied in a supervised industrial experience. Each student's program must be approved by the department's Graduate Program Director. Requires a mid-term report and a final report to be graded by the supervising faculty. *Graded on a Pass/Unsatisfactory basis. May be repeated for credit up to 6 credit hours. Credit hours gained from the internship*

may not be counted toward the courses leading to advancement to candidacy.

STAT 8891. Independent Study in Statistics. (1 to 3)

Prerequisite(s): Permission of department. Faculty-directed independent study of topics not provided by other course offerings and/or to examine, extend, and enrich extant knowledge in statistics through supervised individual study. *May be repeated for credit with change of topic.*

STAT 8892. Directed Project in Statistics. (1 to 3)

Prerequisite(s): Permission of department. The directed independent project may be original work, work of an expository nature, or the mathematical/statistical formulation and solution of a particular problem of statistical significance. The project may also involve a specific application of techniques identified in the literature or studied in other courses. The project must be defended in an oral presentation. *May be repeated for credit up to 9 credit hours.*

Teaching English as a Second Language (TESL)

TESL 5103. Methods in Teaching English as a Second Language. (3) Cross-listed Course(s): EDCI 8183. For current and future teachers of English as a Second Language (ESL) to master a variety of approaches, methods and techniques of teaching ESL and other competencies prescribed by the state of North Carolina.

TESL 5104. Authentic Assessment. (3) For current and future teachers of English as a Second Language (ESL) to develop multiple criteria assessment models as TESL diagnosticians and to master other competencies prescribed by the state of North Carolina. (*Spring*)

TESL 5204. Learning, Schools, and Community. (3) Cross-listed Course(s): TESL 4204. An introduction to supportive teaching and learning practices that operate as reflective spaces within the school context and the communities they serve. Topics include: current school and community demographics, contemporary learning trends, connections to state and national policies, academic language and literacy development patterns, and community-oriented differentiated instruction.

TESL 5205. Second Language Acquisition and Linguistics in K-12 Schools. (3) Cross-listed Course(s): TESL 4205. An examination of concepts, theories, research, and practice related to the language acquisition and literacy development of English Language Learners in U.S. schools. Attention is paid to the physiological, social and psychological variables that influence the academic success of immigrant children and the challenges

associated with first language literacy, second language literacy, and second language development in K-12 settings.

TESL 6000. Topics in Teaching English as a Second Language. (1 to 6) May include classroom and/or clinical experiences in the content area. *May be repeated for credit with permission of department.*

TESL 6204. Multicultural Education. (3) Assists teachers and other school personnel in the development of skills in multicultural curriculum, design and delivery. Examines issues of power, race, class, and privilege that affect the educational success of English Language Learners and other diverse student populations in today's public schools. Addresses the need to develop instructional practices that infuse critical multicultural education into the curriculum.

TESL 6206. Globalization, Communities, and Schools. (3) Cross-listed Course(s): EDCI 8206. An examination of contemporary qualitative theorizations of globalization and its dynamics within and across K-12 schools and communities with implications for better K-12 educational practice. This course does not carry a fieldwork requirement.

TESL 6276. Advanced Pedagogy in Teaching English as a Second Language. (3) Cross-listed Course(s): FLED 6200. Prerequisite(s): Permission of the department. A variety of topics will be addressed in order to prepare experienced second language teachers to be critical thinkers, second language researchers, and instructional and program leaders. Exemplar topics include theories of second language acquisition, the history and trends of second language instructional methods, curriculum design, research-based practices, multicultural education, community partnerships, and mentoring of beginning teachers.

TESL 6470. Internship in Teaching English as a Second Language. (3 to 6) Prerequisite(s): Completion of all education coursework required for the "A" license, background requirements, an application for the course by established deadline, and approval of the department. Student teaching is a planned sequence of experiences in the student's area of specialization conducted in an approved school setting under the supervision and coordination of a university supervisor and a clinical educator. During student teaching, the student must demonstrate the competencies identified for their specific teaching field in an appropriate grade level setting. The student is assigned 15 weeks in a school setting. Includes seminars. Participating students pay a course registration fee for edTPA portfolio assessment. *Graded on a Pass/Unsatisfactory basis.*

TESL 6691. Seminar in Professional Development. (3) Seminar focused on self-direction and professional development of English as Second Language Specialists (ESL), with an increasing emphasis on becoming instructional leaders, as students plan to meet their own learning needs in instructional expertise; expand their awareness of the role of the ESL specialist; plan their program; use technology in presentations; and develop their Master's Thesis, Master's Research Project or Comprehensive Portfolio. The goal of the course is to help the student demonstrate through a culminating teaching portfolio that the student has obtained the knowledge, skills and dispositions of a master teacher.

TESL 6800. Individual Study in Teaching English as a Second Language. (1 to 6) Prerequisite(s): Permission of the student's advisor. Independent study under the supervision of an appropriate faculty member. *May be repeated for credit.*

Translating and Translation Studies (TRAN)

TRAN 5050. Topics in Translation Practica. (3) Selected topics in Translating and Translation Studies. Course may include practice in translating a variety of languages. *May be repeated at UNC Charlotte for credit with change of topic. May be repeated once for Study Abroad credit with change of topic.*

TRAN 5402. Practicum in Translating I - French. (3) Cross-listed Course(s): TRAN 4402. Provides guided practical experience in translating from French to American English, through work with a variety of source texts. Students present their translations to the class.

TRAN 5403. Practicum in Translating II - French. (3) Cross-listed Course(s): TRAN 4403. Prerequisite(s): TRAN 5402. Provides guided practical experience in translating from French to American English, through work with one genre of source texts. Students present their translations to the class.

TRAN 5404. Practicum in Translating III - French. (3) Cross-listed Course(s): TRAN 4404. Prerequisite(s): TRAN 5403. Provides individualized practical experience in translating from French to American English. Students present their translations to the class.

TRAN 5412. Practicum in Translating I - German. (3) Cross-listed Course(s): TRAN 4412. Provides guided practical experience in translating from German to American English, through work with a variety of source texts. Students present their translations to the class.

TRAN 5413. Practicum in Translating II - German. (3) Cross-listed Course(s): TRAN 4413. Prerequisite(s): TRAN 5412. Provides guided practical experience in translating from German to American English, through work with one genre of source texts. Students present their translations to the class.

TRAN 5414. Practicum in Translating III - German. (3) Cross-listed Course(s): TRAN 4414. Prerequisite(s): TRAN 5413. Provides individualized practical experience in translating from German to American English. Students present their translations to the class.

TRAN 5422. Practicum in Translating I - Japanese. (3) Cross-listed Course(s): TRAN 4422. Provides guided practical experience in translating from Japanese to American English, through work with a variety of source texts. Students present their translations to the class.

TRAN 5423. Practicum in Translating II - Japanese. (3) Cross-listed Course(s): TRAN 4423. Prerequisite(s): TRAN 5422. Provides guided practical experience in translating from Japanese to American English, through work with one genre of source texts. Students present their translations to the class.

TRAN 5424. Practicum in Translating III - Japanese. (3) Cross-listed Course(s): TRAN 4424. Prerequisite(s): TRAN 5423. Provides individualized practical experience in translating from Japanese to American English. Students present their translations to the class.

TRAN 5432. Practicum in Translating I - Russian. (3) Cross-listed Course(s): TRAN 4432. Provides guided practical experience in translating from Russian to American English, through work with a variety of source texts. Students present their translations to the class.

TRAN 5433. Practicum in Translating II - Russian. (3) Cross-listed Course(s): TRAN 4433. Prerequisite(s): TRAN 5432. Provides guided practical experience in translating from Russian to American English, through work with one genre of source texts. Students present their translations to the class.

TRAN 6000. Special Topics in Translation Studies. (3) Selected topics in Translating and Translation Studies (e.g., continued study of theories of translation, translation of a literary genre such as prose fiction, drama or poetry, translation of historical, political or social documents, or interpretation). *May be repeated for credit with change of topic.*

TRAN 6472. Workshop on Non-Literary Topics I (Business, Legal, Governmental). (3) Theory-based workshop practicum dealing with the English↔Spanish translation of authentic business, legal, and/or governmental documents.

Emphasis may center on any one of these types of discourse or any combination thereof. *May be repeated for credit with change of topic.*

TRAN 6474. Workshop on Non-Literary Topics II (Medical and Technical). (3) Theory-based workshop practicum dealing with the English↔Spanish translation of authentic medical, technical, and/or scientific documents. Emphasis may center on any one of these types of discourse or any combination thereof. *May be repeated for credit with change of topic.*

TRAN 6476. Workshop on Literary and Cultural Topics. (3) Theory-based workshop practicum dealing with the English↔Spanish translation of literary and/or cultural texts. Emphasis may center on one or both of these types of discourse. *May be repeated for credit with change of topic.*

TRAN 6480. Translation Internship. (1 to 6) On-site work in translating texts or interpreting. Site and workload is determined in consultation with employer and one faculty internship advisor. Translation Internship provides practical and professional training experience under conditions that cannot be recreated in the classroom. The internship course provides Translation Studies/Interpreting graduate students with an opportunity to earn credit for professional, non-classroom experiences related to their area of interest (e.g., legal, medical, scientific, technical, diplomatic, commercial, community). Students gain hands-on translation/interpreting practice and acquire valuable professional and communication skills in the workplace.

TRAN 6601. History, Theory, and Method of Translation. (3) Theories of translation from Horace and Cicero to the present. Provides a historical, theoretical, and sociological framework for the translation enterprise. Emphases may differ from year to year. *May be repeated for credit with change of topic.*

TRAN 6602. Linguistics for Translators. (3) The study of translation issues through the lens of linguistic theory, namely semantic, pragmatic, and psycholinguistic theories.

TRAN 6603. Computer-Assisted Translating. (3) Focus on discourse and textual typologies (representative kinds of writing and kinds of documents and texts) that the practicing translator may encounter. Development of reading, recognition, and reproduction skills. Strategies for lexical development and terminology management. *May be repeated for credit with change of topic.*

TRAN 6604. Translation Project Management. (3) Provides a hands-on introduction to traditional project management and its application to translations and localization projects (cultural adaptation), enhancing one's understanding of the

language industry while providing preparation for a successful transition to the job market.

TRAN 6901. Advanced Project in English↔Spanish Translating. (1 to 3) Selected topics in English↔Spanish Translating and Translation Studies (e.g., continued study of theories of translation, translation of a literary genre such as prose fiction, drama or poetry, translation of historical, political or social documents, or interpretation). *May be repeated for credit with change of topic.*

TRAN 6902. Thesis. (1 to 6) Appropriate research and written exposition of that research, or substantial English↔Spanish translation project with critical introduction and commentary. The proposed thesis work, as well as the final product, will be approved by a committee of three faculty appropriate to the topic, appointed by the Department Chair after consultation with the student and the Graduate Program Director, on the basis of a written proposal from the student. (A statement of recommendations and requirements for form and procedure is available in the Department of Languages and Culture Studies.) *May be repeated for credit up to 6 credits.*

Women's and Gender Studies (WGST)

WGST 5050. Topics in Women's Studies. (1 to 3) Prerequisite(s): Varies with change of topic. Special topics in Women's Studies. *May be repeated for credit with change of topic.*

WGST 5131. Culture, Pregnancy, and Birth. (3) Cross-listed Course(s): ANTH 5131. Explores how culture shapes the experience and practice of pregnancy and birth. Some of the topics explored include the birthing experience, midwifery, infertility, new reproductive technologies, and surrogate motherhood.

WGST 5151. Women, Biology, and Health. (3) An understanding of the structure and functions of women's bodies and examines the social, economic, environmental, behavioral, and political factors associated with women's health.

WGST 5160. Race, Sexuality, and the Body. (3) Examines how biological, historical, and cultural interpretations of race and gender influenced and characterized definitions of sexuality and body image among persons of color.

WGST 5170. Queer Theory. (3) Introduction to key issues in queer theory, a field of studies that questions and redefines the identity politics of early lesbian and gay studies by investigating the socially constructed nature of

identity and sexuality and critiquing normalizing ways of knowing and being.

WGST 5180. Introduction to Gender, Sexuality, and Women's Studies. (3) Understanding the various methods that serve as the foundation for the Gender, Sexuality, and Women's Studies discipline. Given that this discipline is in many ways interdisciplinary, how we conceive of methods is markedly distinct. As such, the methods that serve as foundational for this course concern particular lenses that could (or ought to) be applied to any field of study and yet are also central to Gender, Sexuality, and Women's Studies. Not only does this course seek to understand the experiences of race, gender, sexuality, but it will also seek to expand a framework to account for a multiplicity of systems of oppression, such as ableism, xenophobia, and settler colonialism. Also, this course complicates understandings of these various systems, of the ways in which they compound and intersect. Finally, how we ought to do the work of Gender, Sexuality, and Women's Studies is considered. For instance, how are we to be accountable to the communities we seek to engage with textually? In what ways ought we to develop our political and philosophical commitments when doing this work?

WGST 5190. Indigenous Feminisms. (3) Cross-listed Course(s): WGST 4190. Focuses on Indigenous feminist writings that both aim toward a constructive project of maintaining and respecting Indigenous ways of life, and that seek to address the detrimental consequences of U.S. and Canadian settler colonialism. This begins with a theoretical analysis of key concepts such as settler colonialism, Indigeneity, gender, and institutional racism. Using these key concepts, present-day colonial formations located through state-sponsored child and family welfare services, patterns of incarceration, high rates of sexual violence, and the displacement of Indigenous peoples from their traditional lands are examined. Lastly, state-based efforts to address the needs of Indigenous communities, and collective strategies of resistance practiced by Indigenous women are explored.

WGST 6050. Topics in Women's Studies. (1 to 3)
Prerequisite(s): Varies with change of topic. Special topics in Women's Studies. *May be repeated for credit with change of topic.*

WGST 6601. Theoretical Approaches to Sexuality. (3) An interdisciplinary examination of the history of sexuality and contemporary theories of sexuality and the body. Topics include: historical aspects of sexuality, representations of sexuality, politics of sexuality, critiques of psychoanalytic approaches to sexuality, feminist engagement with biological constructions of sexuality, and queer theory.

WGST 6602. Theoretical Approaches to Gender. (3)
Cross-listed Course(s): ANTH 6612. An interdisciplinary examination of the core theories about the role of gender in identity formation and social organization. Topics include: the feminist critique of biological essentialism; gender as a continuum; the social construction of gender; gender performativity; historical changes in gender; masculinity studies; the intersection of race, class and gender; and the economics of gender.

WGST 6603. Language, Gender and Power. (3) An examination of the ways language constructs sexual difference and power relations among groups. Topics include: the role of language in structuring individual identity and human relations; how that process informs the nature of social institutions; and the control language exercises over human society, from the private to the public domain.

WGST 6627. Feminist Theory and its Applications. (3) An examination of selected works in feminist thought across the disciplines.

WGST 6800. Directed Reading/Research. (3)
Prerequisite(s): Prior written permission of instructor and Women's and Gender Studies Director. Independent investigation of a problem or a topic in Gender, Sexuality or Women's Studies, culminating in a research paper or a final report. Student must provide a written plan of work before registering for the course. *May be repeated for credit.*



Faculty Directory

FACULTY

(Note: The year in parentheses represents the year of appointment)

Gaber, Sharon L (2020); *Chancellor; Professor, Department of Earth, Environmental, and Geographical Sciences; A.B., Occidental College; MPL, University of Southern California; Ph.D., Cornell University*

Troyer, Jennifer (1999); *Provost and Vice Chancellor for Academic Affairs, Belk College of Business; Professor, Department of Economics; B.A., Memphis State University; M.S., Florida State University; Ph.D., Florida State University*

Putman, S. Michael (2011); *Associate Provost for Academic Programs and Space, Department of Reading and Elementary Education; B.A., State University of New York College at Geneseo; M.A.Ed., Ball State University; Ph.D., Ball State University*

Abdulrahman, Abdulwasii Ajibola (2024); *Assistant Professor, Department of Africana Studies; B.A., University of Ilorin, Nigeria; M.A., University of Ilorin, Nigeria; Ph.D., University of Mississippi*

Abel, Kirsten (2023); *Clinical Assistant Professor, Department of Reading and Elementary Education; B.S., Westfield State University; M.Ed., Framingham State College; Ed.D., University of North Carolina at Wilmington*

Abrams, Lyndon P. (2001); *Associate Professor, Department of Counseling; B.S., Charleston Southern University; M.Ed., Clemson University; Ph.D., Texas A&M University-Commerce*

Abu El Ela, Ahmed (2023); *Teaching Assistant Professor, Department of Civil and Environmental Engineering; B.S., University of Zagazig; M.S., University of Zagazig; Ph.D., University of Missouri at Columbia*

Abhyankar, Rohini (2025); *Teaching Assistant Professor, Office of Student Development and Success, The William States Lee College of Engineering; B.S., Delhi University, India; M.S., Syracuse University; M.B.A., University of Phoenix; Ph.D., Arizona State University*

Adams, L. Dean (2013); *Senior Associate Dean of Performing Arts, College of Arts + Architecture; Professor, Department of Theatre; B.A., Tufts University; M.A., University of Maryland; M.F.A., Florida State University*

Afonin, Kirill (2015); *Professor, Department of Chemistry; M.S., Saint Petersburg State Polytechnic University; Ph.D., Bowling Green State University*

Adams, Nicole (2024); *Assistant Professor, Department of Child Development and Special Education; B.A., University of North Carolina at Asheville; M.Ed., Vanderbilt University; Ph.D., University of Illinois*

Ageenko, Ileva (2024); *Senior Lecturer, School of Data Science; M.S., State University of Management, Moscow, Russia; Ph.D., Taras Shevchenko University of Kiev, Ukraine*

Aggarwal, Ishwar D. (2011); *Research Professor, Department of Physics and Optical Science; M.C.E., The Catholic University of America; Ph.D., The Catholic University of America*

Agosta, Rebecca (2013); *Lecturer, Department of Writing, Rhetoric, and Digital Studies; B.S.Ed., Appalachian State University; M.A., University of North Carolina at Charlotte*

Ahmed, Dewan (2013); *Teaching Assistant Professor, Department of Computer Science; B.S., Bangladesh University of Engineering and Technology; M.S., Bangladesh University of Engineering and Technology; Ph.D., University of Ottawa*

Ajazi, Elizabeth (2014); *Lecturer, Department of Mathematics and Statistics; B.S., University of North Carolina at Charlotte; M.S., University of North Carolina at Charlotte*

Akella, Srinivas (2009); *Professor, Department of Computer Science; B.Tech., Indian Institute of Technology, India; M.S., Carnegie Mellon University; Ph.D., Carnegie Mellon University*

Aktas, Yildirim M. (1989); *Associate Professor, Department of Physics and Optical Science; B.S., Middle East Technical University; Ph.D., University of Missouri at Columbia*

Alam, Minhaj Nur (44788); *Assistant Professor, Department of Electrical and Computer Engineering; B.S., Islamic University of Technology; M.S., Islamic University of Technology; Ph.D., University of Illinois - Chicago*

Alexander, Apryl (44788); *Professor, Department of Health Management and Policy; B.S., Virginia Tech University; M.S., Radford University; Ph.D., Florida Institute of Technology*

Alhasan, Dana (2023); *Assistant Professor, Department of Epidemiology and Community Health; B.A., University of Texas at Austin; M.P.H., University of Texas Health Science Center; Ph.D., University of South Carolina*

Aliaga-Buchenau, Ana-Isabel (2002); *Department Chair and Professor, Department of Languages, Cultures, and Translation; B.A., Georg-August Universität Göttingen; M.A., University of North Carolina at Chapel Hill; Ph.D., University of North Carolina at Chapel Hill*

Allan, Craig J. (1992); *Professor, Department of Earth, Environmental, and Geographical Sciences; B.Sc., University of Manitoba; M.Sc., Trent University; Ph.D., York University*

Allen, Tyler (2022); *Assistant Professor, Department of Computer Science; B.S., Western Carolina University; M.S., Clemson University; Ph.D., Clemson University*

Alkan Gokmen, Hatice Pelin (2024); *Lecturer, David R. Ravin School of Architecture Istanbul Technical University, Turkey Scuola Universitaria Professionale della Svizzera Naba Domus Academy, Milan, Italy; M.S., Kadir Has University, Istanbul, Turkey*

Almakhadmeh, Wala'a (2023); *Teaching Assistant Professor, Department of Civil and Environmental Engineering; B.S., Jordan University of Science and Technology; M.S., Concordia University; Ph.D., Concordia University*

Al-Shaer, Ehab (2009); *Professor, Department of Software and Information Systems; B.S., King Fahad University; M.S., Northeastern University; Ph.D., Old Dominion University*

Al-Shamat, Hania Mounir (44788); *Assistant Teaching Professor, Department of Political Science and Public Administration; B.A., American University of Beirut, Lebanon; M.A., American University of Beirut, Lebanon; Ph.D., University of Southern California*

Alston, Daniel (2016); *Associate Professor, Department of Reading and Elementary Education; B.S., University of South Carolina; M.A.T., University of South Carolina; Ph.D., Clemson University*

Alterowitz, Gretchen (2009); *Department Chair and Professor, Department of Dance; B.A., University of Montana; M.F.A., University of Iowa*

Alvis, Sid (2022); *Professor, Office of Student Development and Success, The William States Lee College of Engineering; B.S., Virginia Military Institute; M.B.A., Northern Illinois University*

Amato, Louis (Ted) H. (1980); *Professor, Department of Economics; A.B., Lenoir-Rhyne College; M.A., University of North Carolina at Greensboro; Ph.D., University of South Carolina*

Amburgey, James E. (2005); *Associate Professor, Department of Civil and Environmental Engineering; B.S.C.E., University of North Carolina at Charlotte; M.S., University of North Carolina at Charlotte; Ph.D., Georgia Institute of Technology*

Amengonu, Yawo H. (2015); *Visiting Lecturer, Department of Electrical and Computer Engineering; B.S.E.E., University of North Carolina at Charlotte; M.S.E.E., University of North Carolina at Charlotte*

Amin, Takiyah N. (2011); *Assistant Professor, Department of Dance*; B.A., State University of New York at Buffalo; M.F.A., Virginia Polytechnic Institute and State University; Ph.D., Temple University

Ancrum, Terrence C. (44935); *Visiting Lecturer, Department of Mathematics and Statistics*; B.A., University of North Carolina at Charlotte; M.A.T., University of North Carolina at Charlotte

Anderson, Brittany (2020); *Associate Professor, Department of Middle, Secondary, and K-12 Education*; B.S.Ed., Baylor University; M.Ed., University of North Texas; Ph.D., University of Georgia

Anderson, Heather T. (2007); *Lecturer, School of Nursing*; A.A., Gardner-Webb University; B.S.N., Gardner-Webb University; M.S.N., Gardner-Webb University

Anderson, Kelly (2000); *Professor, Department of Special Education and Child Development*; B.S., Drake University; M.S., Drake University; Ph.D., University of North Carolina at Greensboro

Anderson, Nadia (2016); *Associate Professor, David R. Ravin School of Architecture*; B.Arch., Yale University; M.Arch., University of Pennsylvania

Andrés, Benny J. (2007); *Associate Professor, Department of History*; B.A., San Diego State University; M.A., University of New Mexico; Ph.D., University of New Mexico

Arafa, Ahmed (2019); *Associate Professor, Department of Electrical and Computer Engineering*; B.S., Alexandria University; M.S., University of Maryland, College Park; Ph.D., University of Maryland, College Park

Arif, Ahmed A. (2007); *Professor, Department of Epidemiology and Community Health*; B.S., Sindh Medical College; M.S., Western Kentucky University; Ph.D., University of Texas at Houston

Armour, Jake (2005); *Lecturer, Department of Earth, Environmental, and Geographical Sciences*; B.S., University of New Mexico; M.S., University of New Mexico

Armstrong, Laura M. (2013); *Associate Professor, Department of Psychological Science*; B.S., Brown University; M.S., Pennsylvania State University; Ph.D., Pennsylvania State University

Armstrong, Melinda (2020); *Lecturer, School of Nursing*; B.A., University of North Carolina at Charlotte; B.S.N., University of North Carolina at Charlotte; M.S.N., University of North Carolina at Charlotte

Arnold, Denis G. (2008); *Surtman Distinguished Scholar in Business Ethics; and Professor, Department of Management*; B.S., Lewis and Clark College; M.A., University of Minnesota; Ph.D., University of Minnesota

Arreola, Brian K. (2009); *Professor, Department of Music*; B.M., Saint Olaf College; M.M., Indiana University; Ph.D., Indiana University

Arrigo, Bruce A. (2001); *Professor, Department of Criminal Justice and Criminology*; B.A., Saint Joseph's University; M.A., Duquesne University; Ph.D., Pennsylvania State University

Arthur, Susan T. (2006); *Associate Professor, Department of Applied Physiology, Health, and Clinical Sciences*; B.S., University of Toledo, Ohio; M.S., University of Toledo, Ohio; Ph.D., University of Toledo, Ohio

Asala, Kathryn (2007); *Teaching Professor, Department of Chemistry*; B.S., Truman State University; Ph.D., Miami University

Ashby, Jamie (2024); *MA Fellow, Department of Languages, Cultures, and Translation*; B.A., University of North Carolina at Charlotte; M.A., University of North Carolina at Charlotte; M.A., University of North Carolina at Charlotte

Astratov, Vasily (2002); *Professor, Department of Physics and Optical Science*; Dipl., St. Petersburg State University; Ph.D., Ioffe Physical-Technical Institute

Athanasopoulou, Anna (2013); *Lecturer, Department of Mathematics and Statistics*; B.S., Aristotle University of Thessaloniki; M.A., University of North Carolina at Charlotte; Ph.D., University of North Carolina at Charlotte

Atkinson, Mary L. (2013); *Associate Professor, Department of Political Science and Public Administration*; B.A., Guilford College; M.A., The American University; Ph.D., University of North Carolina at Chapel Hill

Auten, Anna E. (2017); *Assistant Professor and Health and Human Services Librarian, J. Murrey Atkins Library*; B.S., Tulane University; M.A., University of Florida; M.L.I.S., Florida State University

Avila, JuliAnna (2010); *Associate Professor, Department of English*; B.A., University of Redlands; M.A.Ed., University of California, Berkeley; Ph.D., University of California, Berkeley

Avrin, Joel D. (1984); *Professor, Department of Mathematics and Statistics*; A.B., University of California, Berkeley; M.A., University of California, Berkeley; Ph.D., University of California, Berkeley

Azarbayjani, Mona (2010); *Professor, Department of Art and Art History; B.S., Iran University of Science and Technology; M.Arch, Iran University of Science and Technology; Ph.D., University of Illinois atampaign*

Azevedo, Lauren (2023); *Assistant Professor, Department of Political Science and Public Administration; B.A., Mercer University; M.P.A., Georgia Southern University; Ph.D., University of Central Florida*

Bachman, Hunter (2023); *Assistant Teaching Professor, Department of Mechanical Engineering and Engineering Science; B.S., University of Delaware; M.S., University of Delaware; Ph.D., Duke University*

Baez-Rivera, Yamilka I. (2014); *Teaching Assistant Professor, Department of Engineering Technology and Construction Management; B.S.E.E., University of Puerto Rico; M.S.E.E., University of Puerto Rico; Ph.D., Mississippi State University*

Bahamon, Julio C. (2016); *Teaching Assistant Professor, Department of Computer Science; B.S., Texas A&M University; M.S., Florida State University; Ph.D., North Carolina State University*

Bahin, Riley (2024); *Visiting Lecturer, Department of Music; B.M., University of Michigan; M.M., University of Georgia; D.M.A., University of Colorado at Boulder*

Baker, Alyah (2024); *Assistant Professor, Department of Dance; B.A., Duke University; M.F.A., Duke University*

Baker, Debra D. (2003); *Senior Lecturer, Department of Communication Studies; B.A., University of North Carolina at Charlotte; M.A., University of North Carolina at Greensboro*

Balcos, E. E. (2005); *Professor, Department of Dance; B.A., The Colorado College; M.F.A., University of Iowa*

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EMERITUS FACULTY

(Note: The year in parentheses represents the year of appointment)

Emeritus status is an honor and a mark of distinction granted to fully retired faculty members and senior administrative or academic officers whose service is characterized by high personal achievement and outstanding service to UNC Charlotte. Emeritus faculty members are granted several privileges, among them use of the University library and recreational facilities; a University email account; inclusion in the University catalog and campus directory; invitations to University Commencement and other events; opportunity to purchase tickets for University athletic and cultural events at faculty rates; receipt of University and alumni publications; and free campus parking.

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Sherry, Stanley (Lee) A. (2007); *Associate Professor Emeritus, Department of Special Education and Child Development; B.A., Temple University; M.Ed., Temple University; Ph.D., University of Florida*

Shumaker, James D. (1972); *Professor Emeritus, Department of Philosophy; A.B., Pfeiffer College; M.A., Florida State University; Ph.D., Florida State University*

Siegfried Jr., William D. (1976); *Associate Professor Emeritus, Department of Psychology; B.A., Trinity College; M.A., Long Island University; Ph.D., Ohio State University*

Silverman, Gary S. (2012); *Professor Emeritus, Department of Epidemiology and Community Health; B.A., Claremont McKenna College; M.S., University of California, Berkeley; Ph.D., University of California, Los Angeles*

Simono, Ronald Bernard (1967); *Professor Emeritus, Department of Psychology; B.S., St. Norbert College; M.S., University of Wisconsin; Ph.D., University of Wisconsin*

Simpson, Hoyle Mitchel (1982); *Associate Professor Emeritus, Department of Physics and Optical Science; B.A., Pfeiffer College; Ph.D., Clemson University*

Smith, William Alexander (1966); *Associate Professor Emeritus, Department of Electrical Engineering; A.A., Charlotte College; B.S., Charlotte College; M.S., Clemson University; P.E.,*

Smith Jr., Clarence E. (1970); *Professor Emeritus, Department of Educational Leadership; B.A., University of North Carolina at Chapel Hill; M.A.T., University of North Carolina at Chapel Hill; Ed.D., University of North Carolina at Chapel Hill*

Snyder, Robert D. (1975); *Dean Emeritus, The William States Lee College of Engineering; Professor Emeritus, Department of Engineering Science; B.S.M.E., Indiana Institute of Technology; M.S.M.E., Clemson University; Ph.D., West Virginia University; P.E.,*

Sofras, Pamela A. (1976); *Professor Emerita, Department of Dance; B.F.A., The Juilliard School; M.Ed., Lehigh University*

Sohn, David (1964); *Associate Professor Emeritus, Department of Psychology; B.A., Brooklyn College; Ph.D., University of Texas at Austin*

Sommer, John W. (1993); *Distinguished Professor Emeritus; Professor Emeritus, Department of Geography and Department of Political Science; A.B., Dartmouth College; A.M., Boston University; Ph.D., Boston University*

St. Clair, Edward B. (1970); *Associate Professor Emeritus, Department of Religious Studies*; B.A., George Washington University; B.D., Southeastern Baptist Theological Seminary; Ph.D., Duke University

Stephenson, Katherine S. (1986); *Associate Professor Emerita, Department of Languages and Culture Studies*; B.A., Texas Christian University; M.A., University of North Carolina at Chapel Hill; Ph.D., University of North Carolina at Chapel Hill

Stevenson, Thomas H. (1976); *Professor Emeritus, Department of Marketing*; B.S.B.A., Syracuse University; M.B.A., Syracuse University; Ph.D., Case Western Reserve University

Stinnett, Gary (); *Associate Vice Chancellor and University Affirmative Action Officer, Human Resources*

Strassberg, Roy (2001); *Professor Emeritus, Department of Art and Art History*; B.A., State University of New York at Oswego; M.F.A., University of Michigan

Strawn, Martha Ann (1971); *Professor Emerita, Department of Art*; B.A., Florida State University; M.F.A., Ohio University

Studnicki, James (2006); *Professor Emeritus, Department of Epidemiology and Community Health*; B.S., University of Pittsburgh; M.B.A., George Washington University; M.P.H., Johns Hopkins University; Ph.D., Johns Hopkins University

Summerville, Frances Lovenia (1968); *Associate Professor and Librarian Emerita, Atkins Library*; B.A., St. Andrews Presbyterian College; M.L.S., Peabody College

Suther, Judith D. (1979); *Professor Emerita, Department of Languages and Culture Studies*; B.A., University of Missouri; M.A., University of Michigan; Ph.D., University of Missouri

Swartz, Caroline (2006); *Clinical Professor Emerita, Department of Economics*; B.S., State University of New York at Fredonia; M.A., Duke University; Ph.D., Duke University

Swayne, Linda E. (1981); *Professor Emerita, Department of Marketing*; B.B.A., Stetson University; M.B.A., Stetson University; Ph.D., North Texas State University

Swisher, Michael T. (1988); *Associate Professor Emeritus, School of Architecture*; A.B., Washington University; M.F.A., Massachusetts College of Art

Tedeschi, Richard G. (1976); *Professor Emeritus, Department of Psychological Science*; B.A., Syracuse University; Ph.D., Ohio University

Terry, William Scott (1976); *Professor Emeritus, Department of Psychological Science*; B.A., Fairfield University; M.S., Yale University; Ph.D., Yale University

Test, David W. (1983); *Professor Emeritus, Department of Special Education and Child Development*; B.A., Eisenhower College; M.A., Ohio State University; Ph.D., Ohio State University

Testerman, Jane K. (1997); *Associate Professor Emerita, Department of Educational Leadership*; B.A., University of North Carolina at Charlotte; M.Ed., University of North Carolina at Charlotte; Ed.S., Appalachian State University; Ed.D., University of North Carolina at Greensboro

Thomas, Herman Edward (1974); *Professor Emeritus, Department of Religious Studies*; B.S., North Carolina A&T State University; B.D., Duke University; Th.M., Duke University; Ph.D., Hartford Seminary Foundation

Thomas, Mary Beth (1980); *Professor Emerita, Department of Biological Sciences*; B.A., Agnes Scott College; M.A., University of North Carolina at Chapel Hill; Ph.D., University of North Carolina at Chapel Hill

Tierney, Barbara G. (1998); *Associate Professor and Librarian Emerita, Atkins Library*; B.A., Northwestern University; M.L.S.; M.L.S., University of Michigan

Tillotson, Joan S. (1973); *Associate Professor Emerita, Department of Applied Physiology, Health, and Clinical Sciences*; B.S., State University College of New York; M.A., State University of Iowa; Ph.D., State University of Iowa

Tite, Winston R. (1980); *Associate Professor Emeritus, Department of Art*; B.S., Weber State College; M.F.A., Arizona State University

Toenjes, Richard H. (1973); *Associate Professor Emeritus, Department of Philosophy*; B.A., St. Louis University; M.A., St. Louis University; Ph.D., University of Southern California

Tolley, Patricia A. (1995); *Associate Professor Emerita, Department of Engineering Technology and Construction Management*; B.S.M.E., University of North Carolina at Charlotte; M.S.M.E., University of North Carolina at Charlotte; Ph.D., University of North Carolina at Charlotte

Tong, Rosemarie (1999); *Distinguished Professor Emerita, Department of Philosophy*; B.A., Marygrove College; M.A., Catholic University of America; Ph.D., Temple University

Travis, Jim (1973); *Associate Professor Emeritus, Department of Biological Sciences*; B.S., East Texas State College; M.S., East Texas State College; Ph.D., Texas A&M University

Travis, Lucille L. (2006); *Professor Emerita, School of Nursing*; B.S.N., Ohio State University; M.S., Ohio State University; Ph.D., Ohio State University

Trosch, Louis A. (1969); *Professor Emeritus, Department of Finance*; B.A., Bethany College; M.A., George Washington University; J.D., West Virginia University

Tsu, Raphael (1988); *Professor Emeritus, Department of Electrical and Computer Engineering*; B.S., University of Dayton; M.S., Ohio State University; Ph.D., Ohio State University

Tyson, Robert K. (1999); *Associate Professor Emeritus, Department of Physics and Optical Science*; B.S., Pennsylvania State University; M.S., West Virginia University; Ph.D., West Virginia University

Vance, Christine W. (1974); *Associate Professor Emerita, Department of Languages and Culture Studies*; C.E.L.G., Université de Paris et Lille, France; Licence-es-Lettres, Université d'Alger-Aix-en-Provence, France; Licence-es-Lettres, Paris-Sorbonne University, France; M.A., Vanderbilt University; Ph.D., Vanderbilt University

VanSledright, Bruce A. (2011); *Professor, Department of Reading and Elementary Education*; B.A., Calvin College; M.A., Michigan State University; Ph.D., Michigan State University

Vermillion, Robert (1965); *Professor Emeritus, Department of Physics and Optical Science*; A.B., King College; M.S., Vanderbilt University; Ph.D., Vanderbilt University

Walcott, Wayne A. (1970); *Senior Associate Provost Emeritus, Academic Affairs; Associate Professor Emeritus, Department of Earth, Environmental, and Geographical Sciences*; B.S., Western Michigan University; M.A., University of Illinois at Urbana-Champaign; Ph.D., University of Illinois at Urbana-Champaign

Walker, Judith A. (1987); *Professor Emerita, J. Murrey Atkins Library*; B.A., Montclair State College; M.L.I.S., The Catholic University of America

Walsh, Thomas (1970); *Associate Professor Emeritus, Department of Chemistry*; A.B., University of Notre Dame; Ph.D., University of California, Berkeley

Walters, David R. (1990); *Professor Emeritus, School of Architecture*; B.Arch., Newcastle University, England; M.Arch., Newcastle University, England

Wang, Sheng-Guo (1997); *Professor Emeritus, Department of Engineering Technology and Construction Management*; B.S., University of Science and Technology of China, China; M.S., University of Science and Technology of China, China; Ph.D., University of Houston

Watson Jr., Samuel D. (1973); *Professor Emeritus, Department of English*; B.A., Wofford College; M.A., University of Virginia; Ph.D., University of Iowa

Webster, Murray A. (1993); *Professor Emeritus, Department of Sociology*; A.B., Stanford University; M.A., Stanford University; Ph.D., Stanford University

Weekly, James K. (1988); *Professor Emeritus, Department of Marketing*; B.S., Indiana University; M.B.A., Indiana University; D.B.A., Indiana University

Weinstock, Barnet M. (1977); *Professor Emeritus, Department of Mathematics*; A.B., Columbia College; Ph.D., Massachusetts Institute of Technology

Whaley, Charles R. (1974); *Assistant Professor Emeritus, Department of Teaching Specialties*; A.B., Princeton University; M.A.T., University of North Carolina at Chapel Hill; Ph.D., University of Texas at Austin

White, Richard B. (1983); *Professor Emeritus, Department of Special Education and Child Development*; B.A., Miami University; M.S.Ed., Indiana University; Ed.D., Indiana University

Whitmeyer, Joseph M. (1993); *Professor Emeritus, Department of Sociology*; B.S., Wright State University; M.A., University of Washington; Ph.D., University of Washington

Wichnoski, Bruno J. (1974); *Associate Professor Emeritus, Department of Mathematics and Statistics*; B.S., Drexel University; M.S., Tulane University; Ph.D., Tulane University

Wierzalis, Edward (2002); *Clinical Assistant Professor Emeritus, Department of Counseling*; B.S., Pennsylvania State University; M.Ed., Temple University; Ph.D., University of Virginia

Wiggins, Jr., Casper E. (1999); *Distinguished Professor Emeritus, Turner School of Accountancy*; B.A., Wofford College; M.B.A., University of Georgia; M.S., Clemson University; D.B.A., University of Tennessee

Wihstutz, Volker (1987); *Professor Emeritus, Department of Mathematics and Statistics*; Diploma, University of Frankfurt, Germany; Ph.D., University of Bremen, Germany

Wilkinson, Anthony Barry (1987); *Professor Emeritus, Department of Computer Science; B.Sc., University of Salford, England; M.Sc., University of Manchester, England; Ph.D., University of Manchester, England*

Williams, Janet (2008); *Associate Professor Emerita, Department of Art and Art History; B.A., Middlesex Polytechnic University; M.F.A., Cranbrook Academy of Art*

Wilmoth, Margaret (Peggy) C. (1996); *Professor Emerita, School of Nursing; B.S.N., University of Maryland; M.S., University of Maryland; Ph.D., University of Pennsylvania*

Winecoff, Michael (2001); *Associate Dean for Collection Services Emeritus and Associate Professor Emeritus, J. Murrey Atkins Library; B.A., University of North Carolina at Charlotte; M.L.S., University of North Carolina at Greensboro*

Wood, Bret A. (2000); *Lecturer Emeritus, Department of Applied Physiology, Health, and Clinical Sciences; B.S., West Virginia University; M.Ed., University of North Carolina at Charlotte*

Wood, Karen D. (1985); *Professor Emerita, Department of Reading and Elementary Education; B.A., Catawba College; M.A., Appalachian State University; Ed.S., Appalachian State University; Ph.D., University of Georgia*

Wood, Wendy M. (1994); *Associate Professor Emerita, Department of Special Education and Child Development; B.A., Lynchburg College; M.Ed., Virginia Commonwealth University; Ph.D., Virginia Commonwealth University*

Woodward, James H. (1989); *Chancellor Emeritus and Professor Emeritus, Department of Civil and Environmental Engineering; B.S.A.E., Georgia Institute of Technology; M.S.A.E., Georgia Institute of Technology; Ph.D., Georgia Institute of Technology; M.B.A., University of Alabama at Birmingham*

Wright, Hazel Drye (1966); *Assistant Professor Emerita, Department of Mathematics; B.S., Appalachian State Teachers College; M.A., Wake Forest College*

Yon, Maria G. (1987); *Associate Professor Emerita, Department of Reading and Elementary Education; B.S., Concord College; M.A., West Virginia University; Ed.D., Virginia Polytechnic Institute and State University*

Young, David T. (1985); *Professor Emeritus, Department of Civil and Environmental Engineering; B.S.C.E., Clemson University; M.S.C.E., Clemson University; Ph.D., Virginia Polytechnic Institute and State University*

Zellars, Kelly L. (2000); *Professor Emerita, Department of Management; B.A., University of Notre Dame; M.B.A., University of Notre Dame; M.S., University of Wisconsin-Milwaukee; Ph.D., Florida State University*

Zhu, You-lan (1990); *Professor Emeritus, Department of Mathematics and Statistics; Ph.D., Qinghua University, China*

Ziegert, John C. (2010); *Professor Emeritus, Department of Mechanical Engineering and Engineering Science; B.S.M.E., Purdue University; M.S., Northwestern University; Ph.D., University of Rhode Island*

Zimmermann, Gerda Anna Maria (1974); *Associate Professor Emerita, Department of Dance; Diploma, School for Gymnastics, Germany; License, School for Theater, Germany; License, School of Fine Arts, Germany*

Zuber, Richard A. (1978); *Professor Emeritus, Department of Economics; B.A., Wake Forest University; M.A., University of Kentucky; Ph.D., University of Kentucky*



Glossary of Academic Terminology

-123-

49ers – The official name for student athletic teams at UNC Charlotte.

49er Card – The ID Card that proves a student is a member of the campus community and entitled to certain services. It is required to check out materials, obtain services, and utilize facilities across campus. It also allows students to access their residence, obtain meals, and make purchases wherever the 49er Account is accepted.

-A-

Academic advising – A meeting between a student and an advisor to discuss the student's academic plan of study, course selections prior to registration, and/or career plans.

Academic bridge program - A postsecondary school program that helps students transition from high school to a university.

Academic calendar – An official list of dates and deadlines found at the beginning of this *Catalog* and on the website for the Office of the Registrar. The academic calendar specifies the dates for semesters and terms, enrollment periods, examination periods, holidays, periods classes are not in session, and commencement.

Academic career – The period during which a student is working at an institution toward completion of one or more degrees.

Academic discipline – A subject area of study (e.g., English, marketing, psychology).

Academic Petition – An electronic form by which students request to be granted an academic exception because their extenuating circumstances prevent them from following established rules, policies, and procedures.

Academic probation – A status resulting from unsatisfactory academic work; a warning that the student must improve academic performance or be dismissed after a specific period of time.

Academic rank – the rank of a faculty member, such as professor, associate professor, assistant professor, or lecturer. (*See individual listings for details.*)

Academic record – Official transcript.

Academic standing – The scholastic standing of a student based on their grade point average (GPA).

Academic year – The period of formal academic instruction, extending from August through July. It is divided into Fall, Spring, and Summer semesters.

Access – Ensuring equal opportunity for education, particularly for students from historically underrepresented populations and students with disabilities.

Accommodations – Disability Services counselors meet with qualified students to determine and provide reasonable and appropriate accommodations that support the student's educational goals.

Accreditation – UNC Charlotte is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC). SACSCOC is the recognized accrediting body in the eleven U.S. Southern states (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas and Virginia) and in Latin America for those institutions of higher education that award associate, baccalaureate, master's, or doctoral degrees. Accreditation is certification that an institute of higher education meets a set of criteria established by SACSCOC.

Accrediting Body, Accepted - The following are accepted accrediting bodies: Accrediting Commission for Community and Junior Colleges (ACCJC) Western Association of Schools and Colleges, Higher Learning Commission (HLC), Middle States Commission on Higher Education (MSCHE), New England Commission of Higher Education (NECHE), Northwest Commission on Colleges and Universities (NWCCU), Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), and WASC Senior College and University Commission (WSCUC).

ACT – A test published by American College Testing which measures a student's aptitude in mathematical and verbal comprehension and problem solving.

Add/Drop – A designated time period at the beginning of each semester when a student may add or drop a course without penalty. At UNC Charlotte, the Add/Drop period runs through the 6th business day of the Fall and Spring semesters, and through the 2nd business day for Summer full and half terms.

Adjunct faculty – Part-time or temporary faculty member. It may also denote a faculty member from another academic department whose research or teaching interests overlap substantially with those of the appointing department.

Admission to Candidacy- The period in a doctoral student's studies when they are deemed ready to undertake research resulting in a dissertation or scholarly project.

Admissions and Enrollment Counselor – A person working in the Office of Undergraduate Admissions or Office of Graduate Admissions who assists prospective students by providing information on admissions requirements, academic programs, and the application process.

Advanced Placement (AP) – Standardized courses administered by The College Board offered in high school, the completion of which may result in credit for some of the courses normally required for an undergraduate degree. Awarding of credit based on AP is granted to a student based on prior study or experience (usually indicated by the student's performance on the AP examination).

Advisor – For undergraduate students, a department or college-based faculty or staff member who meets with students each semester to discuss curricular choices and progress toward achieving educational goals. For graduate students, typically the Chair of the student's Thesis or Dissertation committee or academic mentor.

Alma mater – The school from which one has graduated, as in "My alma mater is The University of North Carolina at Charlotte."

Alumna/Alumnus (Alumni) – A female/male (group) who attended or graduated from a particular college or university.

Annotated bibliography – A list of citations of books, articles, and documents followed by a brief descriptive paragraph. The purpose of the annotation or description is to inform the reader of the relevance, accuracy, and quality of the sources cited.

Appeal - A formal, written narrative to request reinstatement following suspension or termination.

Articulation agreement – A written agreement listing courses at one educational institution that are equivalent to courses at another educational institution. Articulation agreements facilitate the smooth transition of students through the secondary, community college, and university educational systems.

Assessment – The act of evaluation or appraisal.

Assignment – Required reading and course work to be completed outside of the classroom as determined by instructors. Many instructors list assignments on a syllabus, which is distributed at the beginning of the semester. Other instructors give assignments during class.

Assistant Professor – usually the entry-level rank for a faculty member who holds a doctorate, although this depends on the institution and the field.

Associate Professor – the mid-level rank of a faculty member. It usually indicates that the individual has been granted tenure at the institution.

Associate's degree – A degree traditionally awarded by community or junior colleges after two years of study, or completion of 60 to 64 credit hours.

Asynchronous course - Online course modality where students access materials and complete assignments without any required real-time interaction with the instructor or other students.

Attempted hours - The credits received from courses completed at UNC Charlotte, regardless of grade earned, courses from which students withdrew (W or WE), and courses that were repeated (even if additional credit was not earned).

Audit – Enrolling in a course on an audit basis means the course will not count for credit or impact GPA. Registration for audit requires the permission of the instructor.

-B-

Bachelor's degree or baccalaureate – A postsecondary degree requiring 120 credit hours of specified coursework (except for programs that have applied for and received a waiver to exceed 120 credit hours from the UNC Charlotte Board of Trustees). A bachelor's degree is comprised of General Education courses, a major program(s), elective courses, and, in some cases, a minor program(s), and, in general, is completed in four years.

Blue book – A booklet (often with a blue cover, where it derives its name) that contains lined paper for writing essay test answers.

Bridge program – See *Academic bridge program*.

Bursar - The official at the University who oversees the office that provides quality account management service to students, parents, and alumni by proactively assisting them in meeting their financial responsibilities for attendance.

-C-

Cambridge International Examinations – Standardized courses administered by Cambridge Assessment International offered in high school, the completion of which may result in credit for some of the courses normally required for an undergraduate degree. Awarding of credit based on Advanced (A-Level) or Advanced Subsidiary (AS-Level) examinations is granted to a student based on prior study or experience (usually indicated by the student's performance on the A- or AS-level examinations).

Campus – The area where the main buildings of UNC Charlotte are located, both in University City (main campus) and Center City (Dubois Center).

Catalog – A resource of all academic policies and procedures, college and degree requirements, faculty, and course descriptions. UNC Charlotte has both an *Undergraduate Catalog* and *Graduate Catalog*.

Catalog year – The year during which the regulations of a specific edition of the catalog apply.

Certificate – A structured set of professionally oriented courses designed to provide recognition that the student has completed coursework in an applied area of focus. For degree-seeking students, a certificate program may either complement or be concurrent with a traditional program of study. The certificate appears on the official transcript.

CFNC – College Foundation of North Carolina. A comprehensive website used for applying to colleges, exploring career opportunities, and applying for state and federal aid.

Chancellor – The chief executive officer of UNC Charlotte.

Chancellor's List – The top honors list which recognizes undergraduate students with outstanding records of academic performance (a GPA of 3.8 or greater) and who meet all other criteria. For details, see the Degree Requirements and Academic Policies section of this *Catalog*.

Class standing – Refers to an undergraduate student's official year in school - Freshman, Sophomore, Junior, or Senior – and is based on the number of earned credit hours.

Classification – Level of progress toward a degree based on the number of earned semester/credit hours.

Clinical faculty – A part-time teaching position with limited research responsibilities.

College – An academic unit of the University. Each of the seven discipline-based colleges at UNC Charlotte represents an organization of related departments and/or schools.

College-Level Examination Preparation Program (CLEP) – A program that allows individuals to earn college credit by demonstrating their knowledge of introductory-level college subjects through standardized exams.

Colloquium – A gathering of scholars to discuss a given topic over a period of a few hours to a few days.

Commencement (*also known as Graduation*) – A formal ceremony in which the University awards degrees to graduating students at the end of each Fall and Spring semester, pending receipt of satisfactory final grades.

Commencement Marshals – At each commencement ceremony, the University honors the juniors with the highest grade point averages by inviting them to serve as the marshals who lead the processions of graduates, faculty members, and the platform party.

Community college – A two-year traditional school, offering programs leading to an Associate's degree and, typically, many noncredit courses for community members not seeking a degree. Also called *junior college*.

Concentration – A structured plan of study within a major. (*For example, Public Relations is a concentration within the Communication Studies undergraduate major; Children's Literature is a concentration within the M.A. in English graduate program.*) The number of credit hours for a concentration varies, but is included within the credit hours for the major. The concentration appears on the official transcript.

Contact hours – The number of hours a class meets per week.

Continuing education course (or Professional Development) – A short course or certificate offered for professional development or personal enrichment that does not provide college credit.

Continuous Registration – Enrollment in coursework or research credit every semester without interruption until graduation.

Convocation – The University Convocation is a gathering of senior administration, faculty, administrative staff, and

students to hear statements about the major long-term goals and values of the campus, as well as the major immediate plans and issues confronting UNC Charlotte for the upcoming year, as perceived by the Chancellor, the Provost, and the Faculty President. It is hoped that these presentations will help build a greater shared understanding of the mission of the University and the challenges confronting it. The University Convocation is held at the beginning of the academic year. See also *New Student Welcome*.

Core courses – Required courses in a major program.

Corequisite – Specific conditions, requirements, or courses that must be completed while taking another course (i.e., a lab).

Course – A specific subject studied within a limited period of time. Courses may utilize lectures, discussion, laboratory, seminar, workshop, studio, independent study, internship, or other similar teaching formats to facilitate learning.

Course load – Number of credit hours for which a student is enrolled during a semester.

Course number – The four-letter and four-digit identification code that identifies each course taught at the University, such as ENGL 2126 or PSYC 8151.

Course overload – Defined at UNC Charlotte as over 18 credit hours for undergraduates and over 12 credit hours for graduates during full terms. Within half terms, it is defined as over 7 credit hours. Approval is required to take an overload.

Course sections – Course numbers may be divided when classes also meet in discussion sections, or when a course number has sections pertaining to different topics under the same heading. For instance, a course called Architecture Topical Studio may have section 001 – Cycloramic Models and section 002 – Building Envelopes.

Course title – The name of a specific course that indicates subject and content. *Introduction to Creative Writing* is the course title of ENGL 2126; *Behavior Disorders* is the course title for PSYC 8151.

Coursework – A specified amount of work undertaken in a course which leads to its completion; also, the courses taken to attain a degree in a specified program.

Credit course – A course with specified learning goals which the student is required to meet in order to receive a grade. The course may be applied toward the fulfillment of degree requirements at the University.

Credit for prior learning - Credit is awarded to a student for successfully demonstrating college-level mastery of a given subject gained through prior learning experiences other than curriculum coursework. (See UNC Policy 700.10.1, 700.10.1[R]; 700.7.2[R])

Credit/Semester hours – An amount of work represented in intended learning outcomes and verified by evidence of student achievement. UNC Charlotte adheres to the Carnegie unit, which is a nationally recognized equivalency that consists of not less than:

1. 750 minutes of classroom or direct faculty instruction and a minimum of 1500 minutes of out of class student work for one semester hour of credit. Each credit hour corresponds to 50 minutes per week of classroom or direct faculty instruction and a minimum of 100 minutes of out of class work per week for a 15 week semester, or the equivalent amount of work over a different amount of time, whether instruction is delivered face to face, or in a hybrid or distance mode and regardless of the type of academic work leading to the award of credit hours, such as lecture, seminar, internship, practica, studio, to name a few. Regardless of the length of term, the standard of 750 minutes of contact minutes and 1500 minutes of out of class work for each credit hour remains the same.
2. 1500 minutes of direct faculty instruction for one semester hour of credit for a lab course.

Critical thinking – The practice of thinking things through, in which a student must carefully describe something (an event, a book, a person, etc) and evaluate it according to some relevant criterion, considering significant alternatives. Critical thinking is a core component of *liberal education* and of the *general education curriculum*.

Cross-Listed Course – A single course which is simultaneously listed in the schedule of course offerings by one or more academic departments. They share the same meeting times, room, instructor(s), and curriculum. Therefore, ideally, they should also have the same course title. Students may only receive credit for the single section of the cross-listed course for which they are registered. Credit will not be awarded for a course where credit has already been awarded for its cross-listed equivalent.

Cum Laude – Honorary recognition of the success of a graduating student. Translates to “With Honor.” For UNC Charlotte, it requires a cumulative GPA of at least 3.4, but less than 3.8.

Curriculum – A program of courses that meets the requirements for a degree in a particular field of study.

-D-

DBA - The Doctor of Business Administration is a professional degree taught in an executive format designed to prepare graduates for leadership positions in organizations and teaching careers in academia.

Dean – The highest authority within an academic division of study. An Academic Dean heads each College. In addition to the academic deans, there is also a Dean of Students within the Division of Student Affairs.

Dean's List – An honors list which recognizes undergraduate students who earn a grade point average of at least 3.4 and not more than 3.79 and meet all other criteria. For details, see the Academic Regulations section of this *Catalog*.

Deferment – The postponing of a fee or tuition, which will be paid at a later date.

Degree – Diploma or title awarded to a student who completed a prescribed course of study.

Degree program – An organized sequence of courses that leads to the awarding of a college degree at the undergraduate or graduate level. Sometimes referred to as *Curriculum*.

Degree requirement – A set of requirements, which a student must fulfill before they graduate.

Department/School – A unit within a college representing a discipline. For example, the Department of English is in the College of Humanities & Earth and Social Sciences, and the School of Nursing is in the College of Health and Human Services.

Department chair – The faculty member in charge of an academic department of the university.

Directory Information - Information in a student's education record that would not generally be considered harmful or an invasion of privacy if disclosed. At UNC Charlotte, directory information consists of the student's name, major field of study, dates of attendance, enrollment status, degrees and awards (including scholarships and distinctions) received; and county of residence for award, scholarship, or distinction recipients. See the Family Educational Rights and Privacy Act (FERPA) section of this Catalog for more details.

Disability – The physical and/or learning challenge -- permanent or temporary -- of a student that may impact their academic plan. Accommodations are provided for students with documented disabilities.

Discipline – An area of study representing a branch of knowledge, such as psychology.

Dissertation – The major research project normally required as part of the work for a doctoral degree. Dissertations are expected to make a new and creative contribution to the field of study, or to demonstrate one's excellence in the field.

Dissertation Chair – A graduate faculty member responsible for directing a doctoral student's dissertation research. This may or may not be the student's academic advisor.

Distance Education/Distance Learning - Education that uses one or more types of technology to deliver instruction to students who are separated from the instructor and to support regular and substantive interaction between the students and the instructor synchronously or asynchronously. The following types of technology may be used for distance instruction:

- Internet;
- Satellite or wireless communication; and
- Audio and video conferencing

(34 CFR 600.2 "Distance education" as summarized by the Integrated Postsecondary Education Data System [IPEDS])

For fee charging purposes in the UNC System, a distance education program is one designed to deliver 80 percent or more of the direct instruction through distance education or off-campus, as defined in Section 400.1.1[R](II)(b). There may be a requirement for the student to attend the main campus for a portion of the program, but that requirement is minimal. (See UNC Policy Manual 1000.1.2[IV][A])

DNP - The Doctor of Nursing Practice is a terminal degree designed to prepare graduates to analyze systems of care and provide transformational leadership to improve patient safety, quality of care, and implement evidence-based culturally competent care practices.

Doctoral degree – The most advanced degree, awarded following additional study, often after completion of a master's degree.

Double major – Studying simultaneously for two majors, fulfilling the course requirements for both majors.

Drop/Add – See *Add/Drop*.

Dual/joint degree – Involves a student's working for two different University degrees in parallel, either at the same institution or at different institutions (sometimes in different countries), completing them in less time than it would take to earn them separately. The two degrees might be in the same subject area (especially when the course is split between countries), or in two different subjects.

-E-

Early Entry - Accelerated program for students who begin graduate study during their undergraduate senior year.

Earned hours - The credits received from courses successfully completed at UNC Charlotte.

Ed.D. - The Doctor of Education is a terminal degree designed to prepare educational administrators who can assume mid-level and senior-level leadership positions in public school and postsecondary settings.

Elective course – A course selected at a student's discretion. A *restricted elective course* is a course which must be chosen from a stated group/list of courses to satisfy the program requirements. An *unrestricted elective course* may be in any subject, and may be selected from any course for which the student has the proper prerequisites.

Embargo - In academia, an "embargo" is a restriction placed on research, typically a thesis or dissertation, to be temporarily withheld from publication.

Emeritus faculty – A member of the faculty who has retired but retains the honorary title that corresponds with their last held position at the University.

Equivalency examination (also Challenge Exam or Credit by Exam) - A departmental or institutional exam used to determine if a student's subject matter proficiency is equal to or greater than the corresponding proficiency the student would have achieved had they completed the corresponding course.

Essay – A method of examination, or homework, by which a student presents their knowledge of the subject by writing a composition.

Experiential learning - An engaged learning process whereby students "learn by doing" and by reflecting on the experience. Experiential learning may include community service, service-learning, undergraduate

research, project-based learning, study abroad, and culminating experiences such as internships, student teaching, and capstone projects.

Extenuating circumstances – Personal situations that, upon administrative approval, allow students to withdraw late (if necessary) and to receive “WE” grades.

Extracurricular activities – Activities pertinent to student life, but not part of the regular classroom study (e.g., athletics, publications, and social organizations). Also referred to as *co-curricular activities*.

-F-

Face-to-face - A learning modality where students and instructor meet in person, such as in a classroom. This term can describe a course or a program.

Facilitator – The person in an interactive classroom who assists the instructor or students with distribution of handouts, collection of tests and evaluations, technical and troubleshooting issues, etc.

Faculty – All persons who hold Professorial Rank (Professor, Associate Professor, and Assistant Professor) or a Special Faculty Appointment (Visiting Professor, Adjunct Professor, Instructor, Assistant Professor (Library), Assistant Professor (Military), Lecturer, Assistant Research Professor, or Artist-in-Residence).

FAFSA (Free Application for Federal Student Aid) – A form that all students applying for financial assistance are required to complete in order to determine eligibility for financial aid. This form is available from the Office of Student Financial Aid.

FAQ – Frequently Asked Questions. On the Internet and in print, information sources may provide a list of FAQs to assist newcomers in learning more on their own.

Fees – An amount of money charged by institutions (in addition to tuition) to cover the costs of certain services (health services, athletic center, student activities, registration, parking, use of lab equipment or computers, etc.).

FERPA – The **F**amily **E**ducational **R**ights and **P**rivacy **A**ct (FERPA) is a Federal law that protects the privacy of student education records. The law applies to all schools that receive funds under an applicable program of the U.S. Department of Education.

Final exam – The last, and often the most comprehensive, examination of the entire semester's course material.

Financial aid/assistance – Money available from various sources to help students pay for college. Students must establish eligibility. Funds can be competitive.

Financial aid package – Total amount of financial aid given to a student. Federal and non-Federal aid such as grants, loans, and work-study are combined to help meet the student's need.

Financial need – In the context of student financial aid, financial need is equal to the cost of education (estimated costs for college attendance and basic living expenses) minus the expected family contribution (the amount a student's family is expected to pay, which varies according to the family's financial resources).

Fraternity – A social organization, most often for male students, with specific objectives, rules and regulations.

Full-time student – An undergraduate student with a course load of at least 12 credit hours, as defined by eligibility for federal financial aid, or a graduate student with a course load of at least 9 credit hours. However, undergraduate students need to average a minimum course load of 15 credit hours per semester to graduate within four years.

-G-

General Education Requirements - These courses provide undergraduate students, regardless of their majors, with the foundations of a *liberal education*. For details, see the General Education Program section of the *Undergraduate Catalog*.

Good Academic Standing – Meeting the cumulative GPA requirements for a semester.

Good Academic Standing Warning – The result of unsatisfactory work during the course of a semester; a warning that the student should improve their performance.

GPA (Grade Point Average) – The grade point average for an undergraduate student is determined by adding all accumulated quality points together, and then dividing by the total number of GPA hours the student has attempted, excluding those for which the student received a grade of I, IP, W, WE, H, P, AU, or N. In computing the grade point average, only those credits attempted at UNC Charlotte are included. Refer to the example below.

Example of Transcript:

Subject	Course	Grade	Credit Hours	Quality Points
AMST	2050	P	3.000	0.00
CHEM	1251	F	3.000	0.00
CHEM	1251L	F	1.000	0.00
UWRT	1101	B	3.000	9.00
ENGR	1201	C	2.000	4.00
LBST	2101	C	3.000	6.00
MATH	1241	C	3.000	6.00

Term Totals (Undergraduate)

	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA
Current Term	18.000	14.000	14.000	15.000	25.00	1.666
Cumulative	18.000	14.000	14.000	15.000	25.00	1.666

Example of GPA Calculation:

GPA = Quality Points/CPA Hours; 25/15=1.666

Grades – Evaluative scores provided for each course, and often for individual assignments, examinations, or papers written for that course. There are letter grades (usually A, B, C, D, F) and number grades (usually percentages from 0% to 100%, or on a scale of 0.0 to 4.0). Some undergraduate courses use a *pass/no credit* system with no grades; some graduate courses use a *pass/unsatisfactory* system with no grades.

Graduate assistantship– Employment whereby a graduate student receives financial support for their contributions to the teaching, research, and service missions of the University.

Graduate Faculty Representative - A member of the doctoral student's advisory committee appointed by the Graduate School that assures that the doctoral student is treated fairly and impartially by his or her advisory committee, and assure that University standards and policies are upheld.

Graduate School - The academic college of which all graduate students belong, responsible for the administration of all graduate programs.

Graduate studies – Coursework beyond the bachelor's degree that leads to a graduate certificate, or a master's, professional, or doctoral degree.

Graduation (*also known as Commencement*) – A formal ceremony in which the University awards degrees to graduating students at the end of each Fall and Spring semester, pending receipt of satisfactory final grades.

Graduation with Distinction – Graduating with honors. To be eligible to graduate with distinction, a student must have a certain grade point average computed on at least 48 credit hours of credit completed in residence at UNC Charlotte. (*See Summa Cum Laude, Magna Cum Laude, and Cum Laude*)

Grant – A sum of money given to a student for the purposes of paying at least part of the cost of college. Grants and scholarships do not have to be repaid.

GRE (Graduate Record Examination) – A standardized test that is an admissions requirement for many graduate programs. The exam aims to measure verbal reasoning, quantitative reasoning, analytical writing, and critical thinking skills that have been acquired over a long period of time and that are not related to any specific field of study. The GRE General Test is offered as a computer-based exam administered by selected qualified testing centers.

-H-

Hold Flags – *See Registration hold flags.*

Homecoming – An annual event held by the University to honor alumni.

Honors – A special rank or distinction conferred by the University upon an undergraduate student for excellence in scholarship (based on their GPA). When referring to a course of study, an honors course is for academically talented, enthusiastic, and motivated undergraduate students.

Hoarding - The Doctoral Hooding Ceremony is a tradition of individually recognizing graduating doctoral students through a separate event.

Hybrid - A learning modality that combines multiple learning modalities, such as face-to-face and online, online asynchronous and online synchronous, or some other combination. This term can describe a course or a program.

-I-

In-residence - For degree-seeking students, a residency requirement indicates the number of credit hours that must be completed through the University in order to graduate.

Incomplete grade – An "I" (incomplete grade) may be assigned by a faculty member to a student who carried coursework satisfactorily until near the end of the semester, but who was then unable to complete the course, possibly including the final exam. If the student does not remove the "I" within 12 months, the "I" will be changed to "F," "U," or "N," as appropriate. See the Degree Requirements and Academic Policies section of this *Catalog* for complete details.

Independent study – A method of receiving credit for study or research independent of the assignments of any specific course, but supervised and graded by a faculty member.

Interdisciplinary – A course or program of study involving two or more major areas/departments. For example, Women's and Gender Studies is an interdisciplinary program offering a minor within the College of Humanities & Earth and Social Sciences.

International Baccalaureate (IB) – Standardized courses offered in high school, the completion of which may result in credit for some of the courses normally required for an undergraduate degree. Awarding of credit based on IB is granted to a student based on prior study or experience (usually indicated by the student's performance on IB examinations).

Internet course – A web-based course completed online. Also called an *online course*. May or may not be self-paced.

Internship – A work experience, paid or non-paid, that provides students with practical experience, most often in their field of study.

Intramural/fitness/sport clubs – Programs designed to encourage students to participate in a variety of competitive, instructional, and recreational organized sports activities.

-J-

Job fair – Also known as a *career fair* or *career expo*, it provides a place for employers and recruiters, to meet with student job seekers, typically for entry-level positions. Fairs usually include company or organization tables or booths where résumés may be collected. Occasionally, it is also where students may perform their first interviews with a prospective employer.

Juris Doctor (J.D.) – A professional doctorate and first professional graduate degree in law.

-L-

Laboratory (lab) – A classroom where students apply material in small-group situations that include experiments, assignments, and projects. A lab course typically has an "L" after the course number.

Learning communities – Small groups of new students and faculty who share common interests. Students enroll in

two or more of the same courses and, in many cases, live together in the same residence hall.

Learning strategies – Activities that help people use their own learning style to best approach new learning.

Leave of Absence – Graduate students only may seek a leave from their studies for up to 12 months. During this time, they may not use any University resources.

Lecture – A teaching method in which the professor presents information to the students who take notes, ask questions, and have dialogue with the professor.

Liberal Education – The foundation of the baccalaureate degree in the United States. *Liberal education* strives to make students liberally educated citizens of the world by emphasizing knowledge across disciplines, critical thinking, and application of content. The *General Education Requirements* work toward this end.

Loan – A type of financial aid that is available to students. An education loan must be repaid. In some cases, payments do not begin until the student finishes school.

Lower division course – A course that is intended for freshman and sophomore level students (typically 1000 and 2000 course numbers) that contains introductory content.

-M-

Magna Cum Laude – High honorary recognition of the success of a graduating student. Translates to "With Great Honor." For UNC Charlotte, it requires a cumulative GPA of at least 3.8, but less than 4.0.

Major – A degree-seeking student's primary field of study. A major is a structured plan of study requiring a minimum of 30 credit hours. It must be feasible for undergraduate students to complete degree requirements within 120 credit hours (except for programs that have applied for and received a waiver to exceed 120 credit hours from the UNC Charlotte Board of Trustees). The major appears on the official transcript.

M.A./M.S. – See *Master's degree*.

Master's degree – An advanced degree (e.g., Master of Arts [M.A.], Master of Science [M.S.]) awarded by a university after completion of studies beyond a bachelor's degree.

Matriculated student – A student who has been accepted for admission to the University, has registered in a

curriculum, and is pursuing courses toward a degree or certificate. See also *Non-matriculated student*.

Matriculation – The first enrollment following admission as a student.

Meta-Major – Collections of academic majors that have related courses. Undergraduate students within the University College will have several Meta-Major options to choose from. Meta-Majors provide a clear pathway to declaring a major and help make connections between academics and different career tracks.

Micro-credential – A small, specialized recognition that demonstrates a person's skills, knowledge, or accomplishments in a specific area. These credentials reflect narrow, well-defined competencies and are designed to be more flexible, accessible, and shorter than traditional degree programs. Completion of a micro-credential is often recognized with a digital badge as a validated indicator of an accomplishment, skill, quality, or interest.

Mid-term exam – An (often major) examination given in the middle of the semester that tests the student's knowledge of information taught in the course from the beginning of the course up until the time of examination.

Minor – An undergraduate minor represents an optional, secondary field of study for a degree-seeking undergraduate student; no undergraduate student may declare a major and a minor in the same discipline. An undergraduate minor is a structured plan of study requiring a minimum of 15 credit hours and no more than 29 credit hours exclusive of student teaching. A minor should require significant additional coursework beyond what is already required for the major. The minor appears on the official transcript.

Multiple-choice examination – An examination in which questions are followed by two or more answers, from which a student selects the correct answer.

My UNC Charlotte – One-stop shopping for student services via the Web. It combines various systems, user interfaces, and technical solutions already available to the UNC Charlotte community in a single, consistent web-based interface. Students should use My UNC Charlotte online at my.charlotte.edu to access web-enabled student services, course information, e-mail, and calendar scheduling.

-N-

New Student Welcome – An event dedicated to welcome and introduce new undergraduate students (freshmen and transfers) to the UNC Charlotte academic community. During the event, students learn about UNC Charlotte's traditions, mission, and values that drive the niner spirit.

Niner Central – UNC Charlotte's place to go when you don't know where to go. Students can get answers to questions and receive services for all topics related to financial aid and billing, registration, transcripts, student accounts, academic records, and more.

Niner Nation – The collective UNC Charlotte student body.

Niner Nation Family – The collective parent and family members of UNC Charlotte students.

Noble Niner – The honor code created by the Student Government Association which solidifies the high standard of morals, principles, and integrity that all students should strive to uphold in order to bolster the growing reputation of excellence at UNC Charlotte.

Non-credit – A short course or certificate offered for professional development or personal enrichment that does not provide college credit.

Non-matriculated student – A student who has been accepted for admission to the University, but not yet enrolled. See also *Matriculated student*.

-O-

Objective test – An examination in which questions requiring a very short answer are posed. It can be multiple choice, true/false, fill-in-the-blank, etc. The questions are related to facts (thus objective) rather than to opinions (subjective).

Online – A learning modality which uses the internet to deliver instruction asynchronously or synchronously. This term can describe a course or a program.

Online courses – Courses which are taught and taken either partially or wholly over the Internet.

Open-book examination – A student is permitted to use their textbook, and often classroom notes, during the exam.

Oral examination – A student answers questions by speaking rather than by writing.

Orientation – An organized gathering, held at the beginning of every semester, which provides useful information to new students to acclimate them with the college campus and student life.

-P-

Part-time student – An undergraduate student with a course load of less than 12 credit hours, or a graduate student with less than 9 credit hours. See also *Full-time student*.

Pass/no credit course – A course that rates a student's performance on a pass/no credit basis, rather than on grades.

Ph.D. – The Doctor of Philosophy a type of doctoral degree awarded by a university to students who have completed studies beyond the bachelor's and/or master's degrees, and who have demonstrated their academic ability in oral and/or written examinations and through original research presented in the form of a dissertation (thesis).

Placement test – An examination used to test a student's academic ability in a certain subject so they can be placed in a course at an appropriate level. In some cases, students may get course credits after scoring high on a placement test.

Plagiarism – Passing off someone else's work as your own or using the intellectual property of someone else without giving proper credit. Students must follow certain guidelines to properly acknowledge the use of other people's ideas or words in their work (unless such information is recognized as common knowledge). This is considered a serious offense at every institution, and is subject to disciplinary action that may include failure in a course and/or dismissal from the University.

Pop quiz – A quiz that the instructor has not previously informed the students about.

Postbaccalaureate - A student who has earned a baccalaureate degree and takes educational courses; sometimes referred to as a "post-bacc" or non-degree seeking student.

Postsecondary education – Refers to all education for students after high school, including programs at community colleges, technical colleges, and four-year colleges and universities.

Practicum/Practica - A course where students complete a field experience as part of the regular coursework.

Prerequisites – Specific conditions, requirements, or courses that must be completed before enrolling in another course. Course prerequisites (if any) can be found within each course description. For example, Spanish I is a prerequisite for Spanish II.

Proctor – A person who supervises the taking of an examination to be certain there is no cheating, and that other rules are followed.

Professional credit or professional development courses – Courses offered to improve knowledge and skills in specific professional areas, such as professional development workshops, certification programs, certificates or boot camps. They are usually not offered for academic credit.

Professor – the highest rank attained by a faculty member. Sometimes also called *Full Professor*. A small fraction of tenured faculty are awarded the title of *Distinguished Professor* to recognize outstanding and broad contributions to the advancement of a field of study.

Provost – Reporting to the Chancellor, the Provost is the chief academic officer who oversees all academic affairs activities, including research and faculty. The Deans of each College report to the Provost.

-Q-

Quiz – A short test, written or oral, usually less formal and usually carries less grade weight than an exam.

-R-

Reading Day – Reading Day is to guarantee that students have one day between scheduled classes and the first final examination day. Per the Academic Calendar policy, faculty must not require student participation in any course-related activities on Reading Day.

Readmission – Approval of the enrollment or admission of a former student.

Reassignment of Duties – A period of time (usually one semester) when a faculty member is not teaching, but concentrating on their own education or research.

Registrar – The official at the University who is responsible for maintaining student records. The Office of the Registrar plans and oversees registration, academic record maintenance, transcript preparation, graduation, a degree audit report system, and curricular records.

Registration – Students select courses to enroll in for the subsequent term.

Registration hold flags - Students may be blocked from registering for courses by “hold flags” that may be placed for various reasons, including College or departmental advising requirements, invalid admissions status, outstanding financial obligations, unreturned equipment or library materials, suspension and disciplinary action, or non-compliance with the North Carolina Immunization Law.

Reinstatement - Re-establishment of a student’s active status following a successful suspension/termination appeal or an approved leave of absence.

Required courses – Courses that a student must take in order to complete their degree. In many cases, these courses must be passed with a grade of C or above.

Research paper – A formal written report that includes research findings and a student's own ideas.

Residence - For degree-seeking students, a residency requirement indicates the number of credit hours that must be completed through the University in order to graduate.

Restricted elective course – See *Elective course*.

ROTC – Reserve Officers Training Corps program; a scholarship program wherein the military covers the cost of tuition, fees, and textbooks, and also provides a monthly allowance. Scholarship recipients participate in summer training while in college and fulfill a military service commitment after college.

-S-

SAT – Scholastic Assessment Test I: Reasoning (SAT Reasoning Test) is a standardized test for college admissions that measures a student's aptitude in math, critical reading, and writing.

Schedule of classes – A list of available courses for a specific period of study (i.e., Fall semester), including course numbers, hours, locations, and other pertinent information.

Scholarship – A sum of money given to a student for the purposes of paying at least part of the cost of college. Scholarships can be awarded to students based on academic achievements, financial need, or on many other factors. Scholarships, like grants, do not have to be repaid.

School – See *Department/School*.

Section – One of several classes of the same course. At UNC Charlotte, a three-digit code is used to identify each section of each course offered. For instance, a course called Architecture Topical Studio may have section 001 – Cycloramic Models and section 002 – Building Envelopes.

Self-directed learning – A process in which students take the initiative to diagnose their learning needs, formulate learning goals, identify resources for learning, select and implement learning strategies, and evaluate learning outcomes. The instructor is available as a guide.

Semester or Term – A period of study, usually a third of the academic year (i.e., Fall, Spring, and Summer semesters). Fall and Spring semesters generally include a period of study of one 15-week and two 7-week half terms. The Summer semester generally includes one eleven-week and two five-week half terms. UNC Charlotte offers courses for the Fall, Spring, and Summer semesters, as well as varying term lengths associated with each semester. For the definition of each term refer to the Office of the Registrar.

Semester hour – See *Credit hour*.

Seminar – Most commonly offered as upper-level and graduate courses, these are small classes of approximately 15 students each, designed to facilitate intensive study of specific subject areas.

Service Learning (SL) – Any course with an SL designation must include the scholarly exploration of the concepts of citizenship, public or community service, social issues, or social justice, and provide learning via direct, hands-on experience outside of the classroom.

SOAR – Student Orientation, Advising, and Registration. It is the official UNC Charlotte orientation for new undergraduate students.

Sorority – A social organization for female students, with specific objectives, rules and regulations.

Student Convocation – See *New Student Welcome*.

Studio - A course which typically centers around hands-on design projects, project-based learning, or activities for skill development in applied arts and other fields.

Study abroad – Visiting other countries for educational purposes, including earning academic credit, learning about different cultures, and developing a deeper understanding of the global marketplace.

Subjective test – An examination in which the answers are in the form of narrative sentences, or long or short

essays, often expressing opinions (thus subjective) rather than reporting facts (objective).

Summa Cum Laude – The highest honorary recognition of the success of a graduating student. Translates to “With Highest Honor.” For UNC Charlotte, it requires a cumulative GPA of 4.0.

Supplemental Instruction – Additional assistance for students in historically difficult courses, including accounting, biology, chemistry, communication studies, engineering, mathematics, and physics.

Surveys – A method for collecting information to improve the experience for future students. Current students are often asked to complete questionnaires or participate in focus groups to provide feedback on the quality of services and impact of educational programs.

Suspension – Administrative cancellation of enrollment due to unsatisfactory academic performance.

Syllabus – A course outline typically provided on the first day of class by the instructor that describes course requirements, topics to be covered, required reading, grading criteria, faculty expectations, deadlines, exam dates, class attendance requirements, and other relevant course information.

Synchronous Course – Online course modality that uses real-time interaction with students and instructor with live video conferencing such as Zoom.

-T-

Take-home examination – An examination that may be completed at home. Since students may use additional resources, these exams are usually more difficult than in-class exams.

Term – See *Semester or Term*.

Term paper – A written original work discussing a topic in detail, usually several typed pages in length. Often due at the end of a semester.

Termination (Academic) – Administrative cancellation of enrollment for failure to make satisfactory academic progress following an initial program probation or suspension. Students who are suspended from a graduate program and are denied re-admittance through the suspension appeal process are considered terminated.

Test – An examination, or any other procedure that measures the academic abilities of students.

Thesis – A long essay or dissertation involving personal research, written by a candidate for a graduate degree.

Transcript – A list of all the courses a student has transferred in or taken at UNC Charlotte with the grades that the student earned in each course at UNC Charlotte. A transcript is an exact and complete record of a student's academic history. The University requires a high school transcript when a student applies for admission.

Transferability – The extent to which a course taken from one college or university may be accepted by another. Full or partial transfer of the credit may be available, dependent on factors such as whether the receiving college or university offers an equivalent or similar course at comparable levels of academic expectation for learning. Academic advisors have information about whether and how specific courses will transfer to their institutions and degree programs.

Transfer student – A student who has earned credit in one college or university, and then transfers to another.

Transient study – When credit for courses taken by current UNC Charlotte students at a college or university accredited by an accepted accrediting body are transferred to UNC Charlotte, subject to approval. For details, see the Degree Requirements and Academic Regulations section of this *Catalog*.

True/False examination – An examination in which questions are answered by marking "True" or "False."

Tuition – The amount of money that colleges charge for coursework and other instruction. Tuition can vary widely between educational institutions, and does not cover fees, cost of books, and other materials.

Tuition waiver – A form of financial assistance in which the university may charge little or no tuition.

Tutoring – A method of providing help to students through additional instruction outside of class. Advanced students work with individuals or small groups to increase their understanding of the material.

-U-

Undeclared – A student who has not yet declared a major field of study; sometimes referred to as *undecided*.

Undergraduate studies – A two or four-year program in a college or a university, following high school graduation, which leads to an associate or bachelor's degree, respectively.

University-sanctioned activities - A University-sanctioned event or activity shall be one in which a student represents the University to external constituencies in academic or extracurricular activities including but not limited to University clubs, organizations, athletics, music ensemble tours, teams, and conferences.

Unrestricted elective course – See *Elective course*.

Unsatisfactory grade reports – notifications sent to students in the middle of each semester for courses in which the student is performing below average and a grade has been reported.

Upper-division course – A course that is intended for junior and senior level students (typically 3000 and 4000 course numbers) that contains advanced, and typically more specific, topic content.

-V-

Visiting faculty – Faculty members who come to the university from another institution for an appointment of a year or less, sometimes to fill a temporary vacancy.

-W-

Withdrawal – The procedure in which a student officially removes himself/herself from taking a course, or removes himself/herself from all courses. Tuition may or may not be refunded, depending on the date of withdrawal.

Withdrawal with Extenuating Circumstances (WE) - A Withdrawal with Extenuating Circumstances is for students who are unable to complete their coursework due to an unforeseen circumstance that may include, but not be limited to Personal/Family Emergency, Personal Hardship, Medical/Mental Health Emergency or Military Orders.

W-limit hours – The maximum number of credit hours (currently 16) for which undergraduate students are allowed to receive a grade of W over their academic career at UNC Charlotte.



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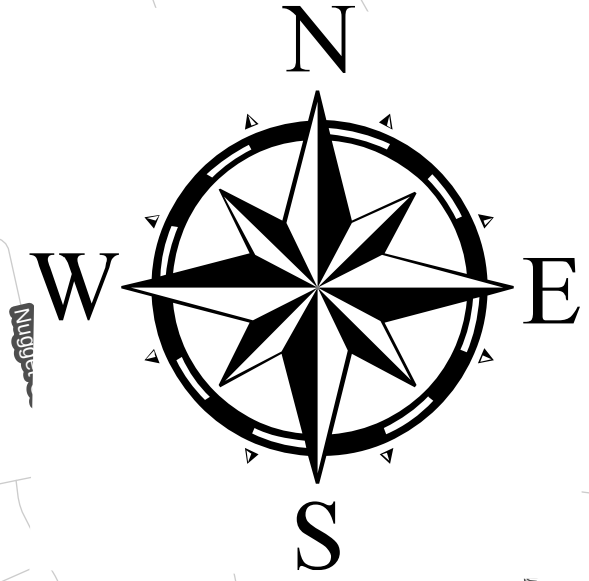


UNIVERSITY OF NORTH CAROLINA
CHARLOTTE

Campus Map

Prepared by:
Facilities Information Systems
(704) 687-8622
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Updated: 10/7/2024



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Interactive
Campus Map



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Academic Buildings

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75	BATT CAVE Research Center	87	Johnson Band Center
17	Belk Gym	97	Klein Hall
68	Bioinformatics	62	Kulwicki Laboratory
38	Burson	02	Macy
42	Cameron Hall	20	McEniry
85	Charlotte Engineering Early College	52	Mebane Hall
63	College of Health & Human Services	18	Memorial Hall
32	Colvard	80	PORTAL
8	Denny	51	Robinson Hall
57	Duke Centennial Hall	19	Rowe
45	Fretwell	12	Smith
		41	Storrs
		10	Winningham
		56	Woodward

Campus Housing

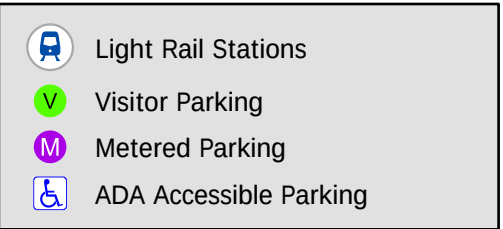
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535	Cedar Hall	564	Martin Hall
543	Elm Hall	561	Miltimore Hall
560	Greek Village	540	Oak Hall
538	Hawthorn Hall	541	Pine Hall
536	Hickory Hall	502	Sanford Hall
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563	Hunt Hall	545	Wallis Hall
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546	Lynch Hall		

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Lot 8 & 8A Lot 13 Lot 16 Lot 20 Lot 21	Lot 6 Lot 25 Lot 27 Lot 101 CRI Deck 1 North Deck	
Disability Accessible		
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46 Barnhardt - Student Activity Center - Halton Arena	5 Cone University Center - Niner Central - Billing and Payments - Financial Aid	54 Bissell House - Chancellor's Residence
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55b Campus Police	1 Kennedy	86 Foundation Annex
5 Cone University Center	11 King	77 Halton-Wagner Tennis Complex
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92 Facility Operations & Parking Services	537 Sycamore Hall	88 Hauser Alumni Pavilion
67 Hayes Baseball Stadium		44 Irwin Belk Track & Field
29 Housing & Res Life		103 Jamil Niner Student Pantry
37 McMillan Greenhouse		15 Niner House
49 Miltimore-Wallis Center		74 NRFC Fieldhouse
91 Price Counseling Center		93 Receiving & Stores
4A University Career Center		79 Richardson Stadium
96 University Recreation Center		78 Rose Football Center
65 Waddell Student Health Center		43 Wells Fargo Fieldhouse
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0 500 1,000 2,000 Feet