CIVIL ENGINEERING

GRADUATE HANDBOOK

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Department of Civil Engineering

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PART I: INTRODUCTION

Program Overview

The Department of Civil Engineering graduate program currently offers two degrees: the Master of Science (M.S.) and the Doctor of Philosophy (Ph.D.) in Civil Engineering. Each of these degrees requires the student to meet specific requirements of both the University of Nebraska-Lincoln Office of Graduate Studies and the Department of Civil Engineering. This handbook describes the departmental programs and requirements for each degree. This handbook is to be considered a supplement to the Graduate Studies Bulletin. Students are advised to consult the Graduate Studies Bulletin at http://www.unl.edu/gradstudies/bulletin for the Office of Graduate Studies degree requirements. Students should direct specific inquiries with respect to the Civil Engineering graduate programs to the following:

Graduate Chair

Dr. Xu Li
Associate Professor
NH W150D
Lincoln, NE 68588-0531

Phone: 402-472-6042
E-mail: xuli@unl.edu

Graduate Secretary

Mrs. Tina Pham
NH 181
Lincoln NE 68588-0531

Phone: 402-472-2371
E-mail: opham3@unl.edu

This handbook is divided into five parts. Part I discusses the Civil Engineering graduate program mission and goals, faculty and staff. Parts II and III describe the graduate degree requirements for the MS and PhD. Part IV covers assistantships and other financial support opportunities. Part V covers academic integrity and professional development.

Program Mission and Goals

The mission of the Civil Engineering department is to provide a culturally diverse and intellectually stimulating environment for the discovery and application of knowledge in civil and environmental engineering; to educate our students to their fullest potential; and to serve the public through outreach and professional activities. In particular, the mission involves:

- Providing the nation with a new generation of engineers that can meet the challenges of the 21st century, particularly related to civil infrastructure
- Serving the state of Nebraska and the nation by providing state-of-the-art expertise in civil engineering
- Making important contributions in various areas of civil engineering by advancing existing knowledge and developing new technologies
- Facilitating the enrichment of the academic and professional experience of students, faculty and the engineering community
- Providing outreach to the public and private sectors

Graduate Studies and Research

The Civil Engineering department offers graduate degrees in Civil Engineering. The Master of Science (MS) degree requires completion of 30 to 36 credits of coursework depending on the option chosen.

- Option I is a thesis based option and is intended for students pursuing a research emphasis. Under this option a student must earn a minimum of 30 semester hours of credit, consisting of 20 to 24 semester hours of regular course work, and present a thesis equivalent to 6 to 10 semester hours.
- Options II and III are coursework based options. Under Option II a student must earn a minimum of 36 semester hours of credit in courses representing a major and either one or two minors.
- Option III also requires 36 semester hours of credit but does not require a minor.

Doctoral study is intended for students seeking in-depth knowledge in an area of civil engineering beyond that resulting from an MS degree, and who wish to pursue faculty positions or other research positions in industry or governmental institutions. Applicants with a BS may apply directly to the PhD program. The minimum amount of graduate credit required for a PhD is 90 semester hours, including a minimum of 12 hours of dissertation credits. Some course work done for a masters degree may be applied toward the required semester hours with approval of the student's supervisory committee and the Dean of Graduate Studies.

In the Department of Civil Engineering, oversight for graduate programs resides with the Graduate Committee, which consists of an elected faculty representative from each of the five discipline areas of civil engineering (environmental, geotechnical/materials, structures, transportation, water resources). The graduate chair serves as the head of this committee and is a point of contact for all Civil Engineering graduate students. The graduate secretary assists the Graduate Committee with administration of the graduate program and can be a helpful point of contact for students during their graduate study.

Department of Civil Engineering Research Specialization Areas and Associated Faculty
The Civil Engineering Department has 31 faculty members, 30 that are active, and 5 that are emeriti faculty (emeriti faculty cannot chair or co-chair graduate committees although they can serve on graduate committees). The active Civil Engineering faculty are listed below by their area of specialization.

Environmental Engineering

The environmental engineering faculty offer graduate course in environmental engineering chemistry, physical chemical treatment processes, biologic treatment processes, design of water and wastewater treatment, environmental microbiology and solid and hazardous waste management. The faculty are engaged in research in environmental microbiology, fate and transport of organic contaminants in soil and water, and design of drinking water and wastewater treatment technologies.

Faculty	Office	Email	Phone
Dr. Shannon Bartelt-Hunt	181D NH/PKI205E, Lincoln/Omaha	sbartelt2@unl.edu	402-554-3868 402-472-8036
Dr. Mohamed Dahab	W154 NH, Lincoln	mdahab1@unl.edu	402-472-2371
Dr. Bruce Dvorak	150C NH, Lincoln	bdvorak1@unl.edu	402-472-3431
Dr. Xu Li	150D NH, Lincoln	xuli@unl.edu	402-472-6042
Dr. Tian Zhang	205D PKI, Omaha	tzhang1@unl.edu	402-554-3784
Dr. Grace Panther	W153 NH, Lincoln	grace.panther@unl.edu	402-472-3431

Geotechnical and Materials Engineering

The geotechnical and materials engineering faculty offer graduate courses in advanced soil mechanics, foundation design including shallow and deep foundations, flexible and rigid pavement design, infrastructure materials (cementitious and bituminous), and advanced mechanics and modeling of infrastructure materials and geotechnics. The faculty are engaged in various research focus on advanced/smart/multifunctional materials, mechanics and modeling of construction materials and infrastructure systems, mechanistic analysis and design with multiphysical phenomena, safety and reliability of geotechnical structures supported on soils and foundations, energy geotechnics, and sustainable infrastructure/geotechnical systems with waste management.

Faculty	Office	Email	Phone
Dr. Jongwan Eun	PKI 203C, Omaha	jeun2@unl.edu	402-554-3544
Dr. Jiong Hu	PKI 203D, Omaha	jhu5@unl.edu	402-554-4106
Dr. Seunghee Kim	PKI 204C,Omaha	seunghee.kim@unl.edu	402-554-3547
Dr. Yong-Rak Kim	362N WHIT, Lincoln	Yong-rak_kim@unl.edu	402-472-1727
Dr. Chung Rak Song	362R WHIT, Lincoln	csong8@unl.edu	402-472-1914

Structural Engineering

The structural engineering faculty offer graduate courses in advanced structural analysis, steel and concrete design, and bridge engineering. The faculty are engaged in research in structural dynamics, non-destructive testing, design of specialized concrete, bridge design and protective design.

Faculty	Office	Email	Phone
Dr. Ron Faller	130R WHIT, Lincoln	rfaller1@unl.edu	402-472-6864
Dr. Gary Krause	204 B PKI, Omaha	gkrause1@unl.edu	402-554-3212
Dr. Daniel Linzell	114L OTHM, Lincoln	dlinzell@unl.edu	402-472-5188
Dr. Jennifer Rasmussen	330 D WHIT, Lincoln	jennifer.rasmussen@unl.edu	402-472-0870
Dr. Chungwook Sim	204A PKI, Omaha	csim@unl.edu	402-554-3049
Dr. Joshua Steelman	362P Whittier, Lincoln	joshua.steelman@unl.edu	402-472-1972
Dr. Christopher Tuan	203F PK, Omaha	ctuan1@unl.edu	402-554-3867
Dr. Christine Wittich	362L WHIT, Lincoln	cwittich@unl.edu	402-472-1915
Dr. Richard Wood	362K WHIT, Lincoln	rwood@unl.edu	402-472-1916
Dr. Jinying Zhu	205B PKI, Lincoln	jyzhu@unl.edu	402-554-4459

Transportation Engineering

The transportation engineering faculty offer graduate course in transportation planning, design, operations and safety with an emphasis on surface transportation. The faculty are engaged in research in transportation planning and safety, intelligent transportation systems, transportation systems analysis, traffic flow theory, traffic characteristics, traffic control systems, alternative energy for transportation systems, operational effects of roadway geometrics, human factors, large scale modeling of transportation systems, transportation economics and airport planning and design.

Faculty	Office	Email	Phone
Dr. Elizabeth Jones	PKI 203E, Omaha	ejones1@unl.edu	402-554-3869
Dr. Aemal Khattak	330E WHIT, Lincoln	akhattak2@unl.edu	402-472-8126
Dr. Massoum Moussavi	PKI 203G, Omaha	mmoussavi2@unl.edu	402-554-3414
Dr. Laurence Rilett	262D WHIT, Lincoln	lrilett2@unl.edu	402-472-1992

Water Resources Engineering

The water resources engineering faculty offer courses in surface water hydrology, groundwater engineering, hydraulic engineering, and water resources planning. The faculty are engaged in research in hydraulics, fluid mechanics, flow measurement and modeling, sediment transport, computational fluid dynamics (CFD), application of remote

sensing and GIS in water resources, groundwater remediation, fate and transport of contaminants in groundwater, water resources management and risk analysis.

Faculty	Office	Email	Phone
Dr. David Admiraal	150F NH, Lincoln	dadmiraal2@unl.edu	402-472-8568
Dr. Junke Guo	204D PKI, Omaha	jguo2@unl.edu	402-554-3873
Dr. George Hunt	206E PKI, Omaha	ghunt2@unl.edu	402-554-4842
Dr. Ayse Kilic	311 Hardin, Lincoln	akilic@unl.edu	402-472-8024
Dr. Yusong Li	150E NH, Lincoln	yli7@unl.edu	402-472-5972
Dr. Chittaranjan Ray	2021 Transformation Dr Ste 3220,Lincoln	cray3@unl.edu	402-472-8427
Dr. Tirthankar Roy	204 C PKI, Omaha	roy@unl.edu	402-554-6255

Department of Civil Engineering Support Staff

The Civil Engineering Department has six staff members who support the graduate program. Tina Pham, located on the Lincoln campus, is the Graduate Secretary. She is assisted by Arlys Blakey on the Omaha campus and Breanne Lewis-Jones on the Lincoln campus. Peter Hilsabeck manages the labs in Lincoln and Jacob Greenleaf manages the labs in Omaha. Patricia Lena is the Administrative Technician in Lincoln.

Staff	Title	Office	Email	Phone
Arlys Blakey	Administrative Technician	200E PKI, Omaha	ablakey1@unl.edu	402-554-2462
Breanne Lewis Jones	Administrative Coordinator	181E NH, Lincoln	blewis7@unl.edu	402-472-8088
Jacob Greenleaf	Lab Technician	126B PKI, Omaha	jacob.greenleaf@unl.edu	402-554-2041
Peter Hilsabeck	Lab Technician	126C SEC, Lincoln	hilsabeck2@unl.edu	402-472-9336
Patricia Lena	Administrative Technician	181C NH, Lincoln	plena2@unl.edu	402-472-8743
Tina Pham	Administrative Technician	181C NH, Lincoln	opham3@unl.edu	402-472-2371

PART II: MASTERS OF SCIENCE PROGRAM IN CIVIL ENGINEERING

A Roadmap to your MS Degree in Civil Engineering

Students pursuing the M.S. Degree in Civil Engineering can follow a thesis option (Option I), or two coursework based options (options II and III). The typical path towards a M.S. Degree in Civil Engineering is as follows:

- Gain admission to the program.
- You will be assigned an advisor upon admission. Once you arrive you should meet with that academic advisor to plan your first semester schedule. If you find that you wish to change advisors, you are free to do so unless your advisor is providing you with a research assistantship on a specific project. If you are supported as a graduate research assistant (GRA), but there are extenuating situations that necessitate changing advisors, you should meet with your current advisor as soon as you decide this is necessary. As part of this meeting, you should plan to discuss how you will fulfill the obligations of your research assistantship. After meeting with your advisor, you should also meet with the graduate chair and your perspective advisor as soon as possible.
- Removal of admission deficiencies. If you have admission deficiencies, you will need to work with your advisor to develop a plan to remove them.
- The Memorandum of Courses must be filed before grades (letter grades, no reports or incompletes) have been received in more than one-half of the program and on recommendation of the major and minor departments and approval of the Dean of Graduate Studies. The Memorandum of Courses is developed by the student and his or her advisor and serves as a roadmap of coursework needed to complete the MS. If needed, the Memorandum of Courses can be updated after it has been initially submitted. Updates to the Memorandum of Courses are done by the student's advisor emailing the master's degree specialist in the Office of Graduate Studies specifying the changes that are to be made.
- Complete the required coursework and your thesis (if you choose the Option I). Most master's degree students in our program finish within two years.
- Students must file an Application for Graduation early in the semester in which they intend to graduate. Applications for Graduation may be submitted electronically via MyRED or by contacting the Office of the University Registrar, 107 Canfield Administration Building South.
- Pass the Written Comprehensive Examination. For Option I students, the thesis serves as the written comprehensive exam – an oral defense of the thesis is also required. Each area of Civil Engineering manages its own written comprehensive exam for Option II and Option III students. Note that the final examination report must be filed *at least four weeks (three weeks in summer)* prior to the date of the oral exam or by the dates shown on the Office of Graduate Studies website. If an oral examination is scheduled, this form must indicate the date and time of the examination and the names of the oral examining committee.
- Submit the final thesis if Option I has been chosen.

Provisional Admission and Deficiency Course Requirements
The discipline diversity in the field of Civil Engineering leads to a student body with diverse backgrounds, and students are sometimes admitted under provisional status, and there may be deficiency course requirements (courses that must be completed, but do not count toward the credit requirement). These decisions are made on the basis of submitted admission materials, and should be considered preliminary, based on our best estimate of your preparation for the M.S. program. Regardless of the type of admission, you will discuss your background and interests in your first meeting with your advisor, and he/she may suggest additional preparation as a part of your M.S. program.

International students who are admitted provisionally with a requirement for additional English language testing or coursework must address this before the start of their first semester. The Programs in English as a Second Language (PIESL) office will administer the tests and provide requirements to your advisor for any language courses you will need as well as guidance on an appropriate first-semester academic load.

If you are admitted with other provisional requirements, you should make sure your advisor is aware of them and you should discuss how to address them early in your program. The provisional status will be changed to regular status when the conditions specified on the admission form have been met, as determined by the Departmental Graduate Chair and approved by the Associate Dean for Graduate Studies.

Advisor Assignment and Selection Process
For students in the civil engineering master's graduate program under Option I, the faculty advisor is the student's academic advisor and thesis advisor. For Options II and III master's students, the faculty advisor is the academic advisor. Faculty advisors must be members of the civil engineering graduate faculty.

At the time of admission into the program, all students are assigned an advisor. Students who are admitted to the graduate program with a research assistantship that is provided by a particular faculty member will be assigned to that faculty member as their academic advisor and thesis/dissertation advisor. Other students may be admitted with a graduate assistantship or fellowship that is from general funds or third-party funds and not explicitly tied to a particular faculty member. In those cases, the selection of an advisor is based on mutual research interests, but the student is free to change advisors, if the student and advisor mutually agree that the change would be beneficial. A common reason to switch advisors is that the student is more interested in the research done by another faculty member than that of the advisor to which he/she was assigned.

The Department's policy is to establish that there is interest from at least one faculty member in advising the applicant prior to sending a letter of admission. When more than one faculty member has expressed interest in serving as academic advisor to a student who was admitted with an assistantship or fellowship from general funds or third parties, the student should select an advisor as soon as possible, typically within the first month and certainly by no later than the end of the first semester as a graduate student.

MS Degree Requirements
The MS degree requires completion of 30 to 36 credits of coursework depending on the option chosen. Option I is a thesis based option and is intended for students pursuing a research emphasis. Under this option a student must earn a minimum of 30 semester hours of credit, consisting of 20 to 24 semester hours of regular course work, and present a thesis equivalent to 6 to 10 semester hours. Options II and III are coursework based options. Under Option II a student must earn a minimum of 36 semester hours of credit in courses representing a major and either one or two minors. Option III also requires 36 semester hours of credit but does not require a minor. More information about the MS degree options is available at https://catalog.unl.edu/graduate-professional/graduate/degrees/masters/

During the first semester of graduate study, the student is expected to work with the advisor to develop a draft Memorandum of Courses that meets the academic needs and interests of the student and complies with the MS civil engineering program requirements. The draft Memorandum of Courses specifies the courses and optional project or thesis that the student will complete. The initial consideration for most students is whether to satisfy the degree requirements through a coursework-only program (Option II or III), or by completing a coursework with thesis program (Option I).

Masters Degree – Option I
Under this option a student must earn a minimum of 30 semester hours of credit, consisting of 20 to 24 semester hours of regular course work, and present a thesis equivalent to 6 to 10 semester hours. At least one-half of the required work, including thesis, must be taken in Civil Engineering. The remaining work may be in supporting courses or in a minor consisting of at least 9 semester hours. Eight hours credit, in addition to the thesis, must be earned in courses open exclusively to graduate students (900 level or 800 level without 400 or lower counterparts).

The subject of the thesis should be chosen from the candidate's field of major interest and must be approved by the student's major advisor. The thesis should reveal a capacity to carry on independent study or research and should demonstrate the student's ability to use the techniques employed in her/his field of investigation. The thesis must conform in style and form to the guidelines set forth in the Guidelines for the Preparation and Submission of an Electronic Thesis found on the UNL Graduate Studies website. An electronic copy of the thesis and abstract must be presented for preliminary review to the Masters Degree Specialist in the Office of Graduate Studies at least two weeks (one week in the summer sessions) before the date for the Candidate's oral examination. A Candidate is not eligible for the oral examination until the thesis is completed and approved by the major adviser. After the thesis has been successfully defended, it needs to be electronically submitted to the Masters Degree Specialist for a final review prior to being uploaded to digital commons.

Masters Degree – Option II
The masters degree under Option II is offered in the Department of Civil Engineering. This option encourages a wider range of courses than is permissible under Option I. Students who have taken the masters degree under Option II and later elect to continue in graduate work for

the degree of doctor of philosophy must give evidence of ability to carry on independent research.

Under this option a student must earn a minimum of 36 semester hours of credit in courses representing a major and either one or two minors. A thesis is not required. A program consisting of a major and one minor must include not fewer than 18 hours in the major and 9 hours in the minor. If two minors are elected, the major must total at least 15 hours and the minors at least 9 hours each. Although most departments stipulate that all course work towards the minor must be taken within the department or interdepartmental area, at the discretion of the minor department up to one-third of the courses required for a minor may be transferred from other institutions. In either case, at least 12 of the 36 hours must be earned in courses open exclusively to graduate students (900 or 800 level without 400 or lower counterparts).

Masters Degree – Option III
The masters degree under Option III is designed especially for the student who plans to continue scholarly work in a civil engineering past the masters level. It permits the substitution of more intensive work in advanced courses for the thesis or minor. Under this option, the student must earn a minimum of 36 semester hours of credit, at least 18 of which must be earned in courses open exclusively to graduate students (900 or 800 level without 400 or lower counterparts). The program must include not fewer than 18 hours in civil engineering.

Minors Within the CIVE MS Program
Under the MS Option I or Option II, a student may pursue up to two minors. At least 1 minor is required for the Option II MS. A minor typically consists of 9 (or more) credit hours in a specific area outside of the major department. The MS degree in Civil Engineering is designed for flexibility, with the required courses in each specialization counting for no more than 9-12 hours of the required 20-36 hours of coursework. A minor may be added to the Option I or II MS in Civil Engineering in a topic of interest to the student. In this past, common minors for CIVE MS students have included: statistics, business, engineering management, natural resource sciences, and community and regional planning. The requirements for each minor vary, and students desiring a minor in a particular area should contact faculty in the department granting the minor to determine specific coursework requirements. Each minor may have requirements for the number of credit hours required as well as the specific courses which count toward the minor. Students are encouraged to identify a minor early in their academic program and work with their CIVE faculty advisor and the Civil Engineering Graduate Chair in conjunction with faculty in the department granting the minor to determine the specific coursework requirements.

<u>Business minor</u>
The following applies to the Business Minor offered through the Lincoln campus.
The MBA program follows different protocols than those for other common minors such as Construction or Mechanical Engineering. The primary point of contact is currently Kerri Hiatt, Assistant Director of MBA Programs and Senior Advisor in the College of Business Administration Office of Graduate Programs (email: kerri@unl.edu, direct phone: 402-472-9033).

The courses taken to satisfy the requirements for a Business minor can also aid in the pursuit of an MBA. The MBA program requires 48 hours of course credit in GRBA courses, but the College of Business Administration is willing to reduce the total number of hours from 48 to a minimum of 36 hours to account for classes previously taken. The minor in graduate Business Administration requires the completion of a minimum of 9 credit hours from the core courses found on the UNL College of Business Administration website.

All of the core classes for the MBA program are offered online 2-3 times a year. The courses are all offered on-campus once a year in the evenings from 5:30-8:20. The MBA program is set up into five 8-week terms. There are 2 fall, 2 spring and 1 summer term. Online tuition is $600/credit hour or $1800/course regardless of residency.

The MBA curriculum can be found at: http://cba.unl.edu/mba/students/prospective/#CU
The MBA course schedule is posted for a year in advance:
https://business.unl.edu/mba/current/ (click on the "online course schedule")

The only prerequisites for the MBA core classes are a course in calculus and one in statistics. The math requirement is needed for the finance, economics and business analytics courses. The courses cannot be found by searching in MyRED. Class codes must be received from a representative of the CBA (currently Ms. Hiatt). Registration for MBA courses opens 30 days prior to the start of the term. MBA students get priority registration. Three days later business minors or other UNL students wanting the courses can be sent the codes to register. Courses are limited to 45 students per course.

If students would like to be added to the list to receive the email with the codes each term, they can notify the CBA Office of Graduate Programs (currently Ms. Hiatt) by email with their name, email and grad program and I will add them to the list.

Roles and Responsibility of the Thesis Advisor
The role of the advisor includes the following:

- Ensuring that graduate students receive information about requirements and policies of the graduate program.
- Advising graduate students on developing a program plan, including appropriate course work, research or creative activity, and on available resources.
- Advising graduate students on the selection of a thesis topic with realistic prospects for successful completion within an appropriate time frame and on the formation of a guidance committee.
- Providing training and oversight in creative activities, research rigor, theoretical and technical aspects of the thesis or project work, and in professional integrity.
- Encouraging graduate students to stay abreast of the literature and cutting-edge ideas in the field.
- Helping graduate students to develop professional skills in writing reports and papers, making professional presentations, establishing professional networks, interviewing, and evaluating manuscripts and papers.
- Providing regular feedback on the progress of graduate students toward degree completion, including feedback on research or creative activities, course work, and teaching, and constructive criticism if the progress does not meet expectations.

- Helping graduate students develop into successful professionals and colleagues, including encouraging students to participate and disseminate results of research or creative activities in the appropriate scholarly or public forums.
- Facilitating career development, including advising graduate students on appropriate job and career options, as well as on the preparation of application materials for appropriate fellowship, scholarship, and other relevant opportunities.
- Writing letters of reference for appropriate fellowship, scholarship, award, and job opportunities.
- Providing for supervision and advising of graduate students when the faculty advisor is on leave or extended absence.

Roles and Responsibility of the Department
Once a permanent thesis advisor is selected, it is unusual to change advisors. However, if a situation arises where a change seems imperative, the student should consult with the Department's graduate chair who will facilitate changes of faculty advisor.

Should the student's advisor leave UNL, it is the department chair's responsibility to facilitate arrangements that allow the student to successfully complete his/her degree program.

Formation of the Thesis Committee
Graduate students selecting the thesis option (Option I) have the responsibility to form a guidance committee with the approval and assistance of the student's advisor, and approval of the Graduate Chair. The guidance committee will consist of at least two members from the graduate faculty of the Department of Civil Engineering and one from the minor department (if applicable). If no minor is chosen, the committee should consist of at least three members from the graduate faculty of the Department of Civil Engineering. If a member of the committee other than the chair leaves the employ of the University, or retires, a replacement should be appointed. In certain circumstances where
a special and needed continuing expertise is involved and the faculty member is willing to continue serving, the departing faculty member may continue as a member or co-chair of the committee, with approval of the department Graduate Committee and the UNL Dean of Graduate Studies. All professors on the committee must either be on the Graduate Faculty, or be non-Graduate Faculty approved to perform specified Graduate Faculty duties.

The responsibilities of the guidance committee include the following:
- Advising graduate students on course work, research, or creative activities.
- Providing, at least annually, feedback and guidance concerning progress toward the degree.
- Reviewing the thesis in a timely, constructive and critical manner.
- Committee chairpersons on leave shall provide for the necessary guidance of their advisees during their absence.

The responsibilities of the student include the following:
- Identifying, in consultation with the advisor, faculty members with the expertise and interest in supervising the proposed research, and meeting with them to discuss their willingness to serve in this capacity.

- Meeting with the guidance committee before the research plan is finalized to review the proposed work, and modify as appropriate.
- Keeping the committee informed on the progress of the research and soliciting their input to address unforeseen issues or to improve quality.
- Scheduling the final examination and providing the committee with a copy of the final written product at least two weeks before the examination.

Nature and Scope of Thesis
The final master's examination is the culmination of a student's graduate education and training and reflects not only the accomplishments of the graduate student but also on the quality of the graduate program. An approved thesis that is accepted by the graduate school becomes a single-author publication and contributes to the body of knowledge of the civil engineering discipline. Approved theses are uploaded to Digital Commons, and instructions for uploading the thesis document can be found in the *Step-by-step Guide to Uploading Your Master's Thesis* document available on Digital Commons.

MS Examination Requirements and Format
For all specializations within Civil Engineering, the comprehensive examination for the MS Option I is met through the presentation of an oral thesis defense. For MS specializations in Geotechnical and Materials Engineering, Structural Engineering, Transportation Engineering and Water Resources Engineering, the comprehensive examination for MS Option II and III is met through a written examination. For the Environmental Engineering specialization, the comprehensive examination for Option II should consist of an oral defense of a report based on non-thesis research to be conducted by the student under guidance of their faculty advisor. For Option III students in all specializations in Civil Engineering, the comprehensive examination will consist of a written examination.

Area-Specific MS Program Coursework Requirements
Within the department of Civil Engineering, the following MS specializations are offered: Environmental Engineering, Geotechnical and Materials Engineering, Structural Engineering, Transportation Engineering, and Water Resources Engineering. Information regarding coursework and exam requirements for each specialization follows. Please note that a selection of a specialization with the MS program in Civil Engineering is not required. The decision to pursue a specific specialization should be made with the input of your graduate advisor.

Specialization in Environmental Engineering:
<u>Required Core Courses (10 credit hours)</u>
CE 823 Physical/Chemical Treatment Processes, 3 cr
CE 828 (Environmental Engineering Chemistry, 3 cr
CE 829 (Biological Treatment Processes, 3 cr
ENVE 990 (Seminar in Environmental and Water Resources Engineering, 1 cr

Students must either take the classes above or show that they have taken equivalent courses approved by faculty of the specialization.

Elective Courses

Each student must also choose electives that provide depth in his/her chosen area of focus within environmental engineering and/or appropriate breadth. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. Relevant electives are listed below but not limited to the following:

Courses offered in the Department of Biological Systems Engineering
AGEN 853 Irrigation and Drainage Systems Engineering
AGEN 953 Advanced Irrigation and Drainage Systems Engineering AGEN 954 Hydraulic Modeling of Small Watersheds
AGEN 955 Solute Movement in Soils (AGRO 955, CIVE 955)
BSEN 841 Animal Waste Management
BSEN 855 Nonpoint Source Pollution Control Engineering
BSEN 941 Agricultural Waste Management
BSEN 943 Bioenvironmental Engineering

Courses offered in the Department of Chemical Engineering
CHME 832 Transport Operations
CHME 835 Transport Phenomena
CHME 842 Chemical Reactor Engineering and Design
CHME 845 Advanced Chemical Engineering Kinetics
CHME 873 Biochemical Engineering
CHME 892 Air Pollution Assessment and Control

Courses offered in the Department of Civil Engineering
CIVE 819 Flow Systems Design
CIVE 821 Hazardous Waste Management and Treatment
CIVE 822 Pollution Prevention: Principles and Practices
CIVE 824 Solid Waste Management Engineering
CIVE 826 Design of Water Treatment Facilities
CIVE 827 Design of Wastewater Treatment and Disposal Facilities
CIVE 830 Fundamentals of Water Quality Modeling
CIVE 831 Small Treatment Systems
CIVE 832 Bioremediation of Hazardous Wastes
CIVE 852 Water Resources Development
CIVE 854 Hydraulic Engineering CIVE
856 Surface Water Hydrology CIVE 858
Groundwater Engineering
CIVE 875 Water Quality Strategy (AGRO 875)
CIVE 898 Special Topics
CIVE 915 Water Resources Engineering
CIVE 916 Interdisciplinary Seminar in Engineering Economics and Legal Aspects of Water Resources Systems
CIVE 921 Advanced Topics in Hazardous Waste Treatment and Remediation
CIVE 926 Advanced Topics in Water Treatment
CIVE 927 Advanced Topics in Water Treatment
CIVE 952 Water Resources Planning

CIVE 954 Advanced Hydraulics
CIVE 955 Solute Movement in Soils (AGEN 955, AGRO 955)
CIVE 958 Groundwater Mechanics
CIVE 959 Groundwater Modeling

Specialization in Geotechnical and Materials Engineering:
Required core courses (12 credits)

Core courses (12 credits), listed below, provide exposure to the basic aspects of geotechnical-materials engineering. Students who have already taken such courses have an increased number of electives that they can take as part of their program.

CIVE 834 Soil Mechanics II (3 credits)
CIVE 836 Foundation Engineering (3 credits)
CIVE 872 Pavement Design and Evaluation (3 credits)
CIVE 851 Introduction to Finite Element Analysis (3 credits)

Students must either take the classes above or show that they have taken equivalent courses in their undergraduate program, or equivalent courses approved by faculty of the specialization.

Elective courses
Each student must also choose electives that provide depth in his/her chosen area of focus within geotechnical-materials engineering and/or appropriate breadth. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. Relevant electives are listed below but not limited to this.

Civil Engineering Electives
CIVE 840 Reinforced Concrete Design I
CIVE 842 Structural Dynamics
CIVE 844 Structural Design and Planning
CIVE 847 Reinforced Concrete Design II
CIVE 850 Prestressed Concrete
CIVE 857 Applied Structural Analysis CIVE
865 Highway Geometrics
CIVE 871 Bituminous Materials and Mixtures
CIVE 898 Special Topics in Civil Engineering (by permission of advisor only)
CIVE 998 Special Topics in Civil Engineering (by permission of advisor only)

Construction Management Electives
CNST 885 Construction Project Scheduling and Control
CNST 886 Construction Management Systems

Mechanical and Materials Engineering Electives
MECH 847 Advanced Dynamics

MECH 848 Advanced Mechanics of Materials
MECH 854 Introduction to Continuum Modeling
MECH 852 Experimental Stress Analysis I MECH
880 Numerical Methods in Engineering MECH 910
Continuum Mechanics
MECH 918 Fundamentals of Finite Elements MECH
930 Mechanics of Composite Materials MECH 933
Theory of Elasticity I
MECH 934 Theory of Elasticity II
MECH 939 Viscoelasticity MECH
940 Fracture Mechanics MECH 942
Theory of Plasticity

Statistics Electives
STAT 801 Statistical Methods in Research
STAT 802 Experimental Design
STAT 870 Multiple Regression Analysis

Mathematics Electives
MATH 814 Applied Linear Algebra
MATH 815 Modern Algebra with Applications
MATH 821 Differential Equations
MATH 822 Advanced Calculus
MATH 824 Introduction to Partial Differential Equations MATH
827 Mathematical Methods in the Physical Sciences MATH 830
Ordinary Differential Equations I
MATH 831 Ordinary Differential Equations II
MATH 840 Numerical Analysis I
MATH 842 Methods of Applied Mathematics I
MATH 843 Methods of Applied Mathematics II

Specialization in Structural Engineering:
Required basic core courses
Structural engineering graduate students are strongly encouraged to take all courses listed as core courses, below. However, students are *required* to take a minimum of 9 total credits of core courses. Selection of core courses shall consist of *at least* one Computational / Analysis course (3 credits) and *at least* one Advanced Design course (3 credits). Students who have already taken such courses have an increased number of electives that they can take as part of their programs.

Computational / Analysis core courses:
CIVE 842 Structural Dynamics

CIVE 843 Advanced Structural Analysis (*new course number pending approval by College Curriculum Committee*)
CIVE 849 Introductory Finite Element Analysis in Solid Mechanics (*new course number pending approval by College Curriculum Committee*)
CIVE 851 Introduction to Finite Element Analysis (*retiring course number, previously offered jointly as 451/851 as MECH / CIVE*)

Advanced Design core courses:
CIVE 846 Steel Design II
CIVE 847 Reinforced Concrete Design II
CIVE 850 Prestressed Concrete

Students must either take core classes from among those listed above to fulfill the core course requirements or show that they have taken equivalent courses in their undergraduate program or equivalent courses approved by faculty of the specialization.

Elective courses
Each student must also choose electives that provide depth in his/her chosen area of specialization within structural engineering and/or appropriate breadth. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. Commonly selected relevant structures electives taken by students specializing in Structural Engineering are listed below. Electives are not limited to this list, however.

CIVE 834 Soil Mechanics II
CIVE 836 Foundation Design
CIVE 839 Introduction to Bridge Design
CIVE 857 Applied Structural Analysis
CIVE 859 Reliability of Structures
CIVE 898 Nondestructive Testing
CIVE 940 Behavior of Steel Members
CIVE 945 Structural Design for Dynamic Loads
CIVE 948 Blast-resistant Structural Design
CIVE 949 Steel Bridge Design
AREN 851 Masonry and Timber Design

Specialization in Transportation Engineering:
Required basic core courses
Basic/core courses (9 credits), listed below, provide exposure to the various aspects of transportation and background in applied statistics (implicit in the 800-level transportation classes). Students who have already taken such courses have an increased number of electives that they can take as part of their program.
CIVE861 Urban Transportation Planning (3 credits)
CIVE862 Highway Design (3 credits)
CIVE863 Traffic Engineering (3 credits)

Students must either take the classes above or show that they have taken equivalent courses in their undergraduate program or equivalent courses approved by faculty of the specialization.

Required core courses

In addition to the required courses above (traffic engineering, transportation planning, and highway design), PhD students are also required to take the three following courses for a total of nine (9) credits. These courses provide more depth in key areas.
CIVE864 Analysis & Estimation of Transportation Demand (3 credits)
CIVE865 Highway Geometrics (3 credits) CIVE866
Transportation Characteristics (3 credits)

In addition to the three courses above, all PhD students are required to take the following:
STAT801 Statistical Methods in Research (4 credits)
CIVE989 Transportation Seminar (1 credit)

Students must either take the classes above or show that they have taken equivalent courses approved by faculty of the specialization.

Elective courses

Each student must also choose electives that provide depth in his/her chosen area of specialization within transportation and/or appropriate breadth. These courses are to be selected in conjunction with and approved by the student's faculty advisor and supervisory committee. Relevant transportation electives are listed below. Electives are not limited to this list, however.
CIVE867 Transportation Safety Engineering (3 credits)
CIVE868 Airport Planning & Design (3 credits)
CIVE869 Computer-aided Interchange Design (3 credits)
CIVE961 Mass Transit Systems (3 credits)
CIVE962 GIS in Transportation (3 credits) CIVE963
Highway Safety Data Analysis (3 credits)
CIVE964 Theory of Traffic Flow (3 credits)
CIVE965 Traffic Control Systems (3 credits)
CIVE966 Transportation Planning & Economics (3 credits)
CIVE967 Analysis & Design of Transportation Supply Systems (3 credits)

Specialization in Water Resources Engineering:

Required Core Courses

To obtain a specialization in water resources engineering, students must take the courses listed below or demonstrate to the satisfaction of the specialization advisory committee that they have taken sufficient course-work to cover the material in these courses:

CIVE 854 Hydraulic Engineering (3 credits)
CIVE 856 Surface Water Hydrology (3 credits)
CIVE 858 Groundwater Engineering (3 credits)

ENVE 990 Seminar in Environmental Engineering (1 credit)

Students must either take the classes above or show that they have taken equivalent courses in their undergraduate program, or equivalent courses approved by faculty of the specialization.

Elective Courses

Students must choose electives that provide depth and breadth in water resources engineering. These courses are to be selected in conjunction with, and approved by the student's faculty advisor and supervisory committee.

A partial list of relevant water resources electives are listed below:
CIVE 819 Flow Systems Design (3 credits)
CIVE 830 Fundamentals of Water Quality Modeling
CIVE 852 Water Resources Development
CIVE 855 Nonpoint Source Pollution Control Engineering
CIVE 875 Water Quality Strategy
CIVE 898 Special Topics
CIVE 915 Water Resources Engineering
CIVE 916 Interdisciplinary Seminar in Engineering: Economic and Legal Aspects of Water Resources Systems
CIVE 952 Water Resources Planning
CIVE 954 Advanced Hydraulics
CIVE 958 Groundwater Mechanics
AGEN 853 Irrigation and Drainage Systems Engineering
AGEN 953 Advanced Irrigation and Drainage Systems Engineering
AGEN 954 Hydraulic Modeling of Small Watersheds
AGEN 955 Solute Movement in Soils

PART III: PH.D. PROGRAM IN CIVIL ENGINEERING

A roadmap to your PhD degree

The typical path toward a doctoral degree in Civil Engineering at the University of Nebraska-Lincoln is as follows:

- Gain admission to the program. For most of our admitted Ph.D. students, financial aid is provided in the form of a graduate assistantship.
- You will be assigned an academic advisor based on your interests. If you receive a graduate research assistantship, then your academic advisor will be the faculty member providing your assistantship support. Your advisor will be a member of the department graduate faculty and will serve as the chairperson of your doctoral supervisory committee. If you find that you wish to change advisors, you are free to do so unless your advisor is providing you with a research assistantship on a specific project. If you are supported as a graduate research assistant, but there are extenuating situations that necessitate changing advisors, you should meet with your current advisor as soon as you decide that this is necessary. As part of this meeting, you should plan to discuss how you will fulfill the obligations of your research assistantship. You and your current advisor must put in a letter signed by both you and your current advisor that fully describes how you will fulfill the obligations of your research assistantship. After meeting with your current advisor, you should also meet with your current advisor and your perspective advisor as soon as possible. You must have a letter signed by you, your current advisor and your perspective advisor stating that all have agreed to this change of advisor.
- Pass the doctoral qualifying exam. The qualifying exam must generally be taken within the first 20 hours of graduate course work. Current master's students transferring to the Ph.D. should take the qualifying exam prior to starting the Ph.D. or during the first semester in the Ph.D. program. Students may only take the qualifying exam twice. If you do not pass the exam in either attempt, you will be removed from the graduate program. Details about the qualifying exam can be found in later in this handbook.
- After passing the qualifying exam, choose your Supervisory Committee and submit the Appointment of the Supervisory Committee form to Graduate Studies with a copy to the Graduate Secretary.
- Design a program of coursework with your Supervisory Committee. The Program of Studies for the Doctoral Degree should be submitted to Graduate Studies within the semester of the approval of your Supervisory Committee by Graduate Studies. Also, submit a copy of your Program of Studies to the Civil Engineering Graduate Secretary.
- Pass the comprehensive exam, including a successful presentation of your dissertation proposal. This is done when coursework has been substantially completed. Upon passing the comprehensive exam, submit the Application for Admission to Candidacy form with a copy to the Civil Engineering Graduate Secretary
- Complete your research, write your dissertation, and defend it in an oral examination.

- Most Ph.D. students in civil engineering at UNL should be able to finish their doctoral program in an average of approximately three to four years (beyond the M.S. degree). All requirements for the degree are to be completed by eight (8) years from the time of filing the program of studies with Graduate Studies.

Summary of Coursework, Research and Examination Requirements

The PhD degree in Civil Engineering should ordinarily take no more than five years to complete. While individual circumstances will vary, a typical timeline will be as follows:

Year 1 (0-21 credits): Coursework and qualifying examination
Year 2 (22-42 credits): Coursework, preliminary research, supervisory committee selection, submission of Program of Studies
Year 3 (43-63 credits): Coursework, preliminary research, comprehensive exam
Year 4 (64-84 credits): Research
Year 5 (85 or more credits): Research, completion of dissertation, final oral examination

Supervising Professor/Academic Advisor

The Civil Engineering Graduate Committee provides oversight of academic advising for current graduate students. All Civil Engineering graduate students must have a Civil Engineering graduate faculty member as their academic advisor, including those Civil Engineering students funded by faculty from another department. If a faculty member from another department is providing funding for a Civil Engineering graduate student, that faculty member may serve as a co-chair of the students committee. Upon admittance to the Civil Engineering department's graduate program each graduate student is assigned a personal academic advisor. The academic advisor is assigned based on the survey of Civil Engineering faculty regarding the admission of an applicant. If more than one faculty member has agreed to be the advisor for an applicant, the graduate student's initial temporary academic advisor will be the graduate committee member for the graduate student's discipline. The newly admitted graduate student will then visit with all faculty expressing interest in advising the student, and the student will select their advisor from the Civil Engineering faculty expressing interest in advising the student. All newly admitted graduate students with a choice of academic advisors must choose their academic advisor by no later than the end of the second week of the semester to which they are admitted.

Supervisory Committee

Each graduate student admitted to the doctoral program must form a supervisory committee in consultation with their supervising professor. The supervisory committee for any doctoral student should be formed prior to the completion of 36 hours of coursework and not later than the completion of 45 hours of coursework.

The committee will consist of at least four Graduate Faculty members. The majority of the committee members are expected to be Civil Engineering Graduate Faculty members. At least one Graduate Faculty member external to the academic department or area in which the doctorate is to be granted must be included on the committee responsible for supervising the student's doctoral program of studies. The representative of the minor department on the committee may serve as the outside representative. All faculty on the supervisory committee must either be on the Graduate Faculty, or be non-Graduate Faculty approved by the department

Graduate Committee, the department Graduate Chair and the Dean of Graduate Studies to perform specified Graduate Faculty duties. Contact the department Graduate Chair for information on the process needed to have a non- Graduate Faculty member approved to serve on your committee.

Information on the specific roles of supervisory committee members can be found in the Graduate Bulletin. Briefly, the chair serves as the advisor and mentor to the student and assists the student with selection of other supervisory committee members, selection of courses for the students Program of Studies, and monitors the student's progress. Two members of the supervisory committee are designated as reading members. These members, along with the chair, read the draft of the dissertation to determine if the student is ready to defend. One member of the committee must be external to the student's major program but serve as a graduate faculty member within the University of Nebraska system. If a faculty member from a different UNL department is serving as a student's co-chair, they cannot also serve as their outside representative.

PhD Curricula

The graduate curricula consist of three elements:

i. Learning outcomes
ii. Coursework requirements
iii. Examination requirements

Each element is covered below.

Learning Outcomes of the PhD Program in Civil Engineering

- *Fundamental Knowledge*: Graduates will command profound basic and applied knowledge in their specialty area within their specialization. This will be achieved through their coursework. Evaluation of this outcome will be through the qualifying exam.
- *Independent Abilities*: Graduates will have the ability to conduct a major independent and original research study that includes gathering of information, gaining an understanding of the process of academic or commercial exploitation of research results, demonstrating an understanding of contemporary research issues, effective project management, synthesis and evaluation, and appropriate dissemination of research findings. This outcome will be achieved through and evaluated using their dissertation research and publications resulting from the dissertation research.
- *Critical Thinking*: Graduates will have a profound ability to critique and synthesize literature, review results and to apply knowledge gained from literature to develop new ideas, to design and evaluate scientific investigations, and to assess, interpret and understand data related to their specialty area within their specialization. Evidence of this outcome is demonstrated in and evaluated using the comprehensive exam and the dissertation research.
- *Advanced Knowledge*: Graduates will demonstrate profound mastery of the subject matter at a deeper theoretical and applied level well beyond fundamental knowledge gained in the undergraduate course sequence and the higher-level knowledge gained in the master's level course sequence. Evidence of this will be demonstrated through the qualifying exam, the comprehensive exam and the final exam.

- *Effective Communication*: Graduates will have the ability to construct coherent arguments and articulate ideas clearly to an audience, through a variety of techniques, constructively defend research outcomes, justify their research to the profession and promote the public understanding of their research fields. This will be achieved through presentation and publication of the student's dissertation research.
- *Professional Development:* A student graduating with a doctoral degree in civil engineering is expected to demonstrate interest in pursuing life long learning by attaining professional licenses, and obtaining professional development hours by attendance at conferences, higher educational classes, short courses and seminars, conducting classes, and publishing. Periodic surveys of our graduates will be the method used to evaluate this outcome.

The Civil Engineering major has five specializations – environmental engineering, geotechnical and materials engineering, structural engineering, transportation engineering, and water resources engineering.

Coursework and Research Requirements by Specialization

The minimum amount of graduate credit is 90 semester hours, including a dissertation. Up to 30 credits from a master's degree may be counted towards the PhD in Civil Engineering. The PhD program in Civil Engineering will normally include a minimum of 12 hours and a maximum of 55 hours of dissertation research. There is no uniform language or research tool requirement for the PhD in Civil Engineering.

Program of Studies

It is important that the coursework clearly support and are related to the area of research that will form the basis for the dissertation. A mismatch between the coursework and the dissertation research may significantly lengthen the time to complete the PhD degree. It is important that each student work closely with his or her supervising professor and supervisory committee to develop a Program of Studies that not only fulfills the coursework requirements described below but also supports the student's intended research work. A Program of Studies should be completed, approved by the student's supervisory committee and submitted to the Office of Graduate Studies prior to the completion of 36 hours of coursework and not later than the completion of 45 hours of coursework. Completion of a Program of Studies later than this may cause the student to be required to take additional courses beyond the typical amount of coursework for a PhD student and significantly delay the completion of the PhD degree.

Core Courses

Each discipline has a set of required core courses that they expect all students graduating with a PhD to have successfully taken. The specific coursework requirements vary by specialization as described below.

Environmental Engineering

Preparatory/Required Undergraduate Courses

Although an undergraduate degree in Civil Engineering is not required as a prerequisite to the PhD program in environmental engineering, students who do not have a BS in civil

engineering will normally be required to complete those undergraduate courses that provide appropriate background. Required undergraduate preparatory coursework will include mathematics through differential equations; a course in computer programming; 12 hours of chemistry, physics or geology courses, and 12 hours of engineering sciences courses including statics, fluid mechanics and 6 hours of coursework from the following courses (or their equivalent): ENGM 373 Engineering Dynamics, ENGM 325 Strength of Materials, CHME 332 Transport Operations I, PHYS 212, and ELEC 211

An introductory course in environmental engineering (CIVE 326 or equivalent), an introductory environmental engineering laboratory course (CIVE 327 or equivalent), and one additional 400-level environmental engineering course (such as CIVE 425 Environmental Engineering Process Design) will typically be required.

Required basic core courses, required core courses and elective courses
All environmental PhD students will be expected to complete similar coursework to what is listed under the MS program coursework requirements for the specialization in Environmental Engineering. Please refer to the course requirements for MS students in this document.

Geotechnical and Materials Engineering
Preparatory/Undergraduate core courses
Although an undergraduate degree in civil engineering is not required as a prerequisite to the PhD program in geotechnical-materials engineering, students who do not have a BS in civil engineering will normally be required to complete those undergraduate courses that provide appropriate background. Required undergraduate preparation would generally include mathematics (through calculus, geometry, and differential equations), an introductory course in statistics (e.g., STAT 380 at UNL) or an equivalent, and engineering mechanics (e.g., MECH 223 and 325 at UNL). General introductory courses in geotechnical-materials (e.g., CIVE 334 and 378 at UNL) are also necessary. While 300 (junior)-level courses cannot count toward the program requirements, a limited number of 400 (senior)-level classes with a corresponding 800-level component (15 credits) can be counted.

Required basic core courses, required core courses and elective courses
All geotechnical and materials PhD students will be expected to complete similar coursework to what is listed under the MS program coursework requirements for the specialization in Geotechnical and Materials Engineering. Please refer to the course requirements for MS students in this document.

Minor
All geotechnical-materials engineering PhD students are encouraged but not required to have a minor in a closely related discipline. Minors selected by previous students include Mechanical and Materials Engineering, Construction Management, Statistics and Mathematics.

Structural Engineering
Preparatory/Undergraduate core courses

Although an undergraduate degree in civil engineering is not required as a prerequisite to the PhD program in structural engineering, students who do not have a BS in civil engineering will normally be required to complete those undergraduate courses that provide appropriate background. Required undergraduate preparation would generally include mathematics through differential equations and an introductory course in statistics (e.g., STAT380 at UNL) or an equivalent. A general introductory course in structures (e.g., CIVE 341 at UNL) and one in a specific area (i.e., reinforced concrete design, steel design, and structural analysis) are also desirable. While 300 (junior)-level courses cannot count toward the program requirements, a limited number of 400 (senior)-level classes with a corresponding 800 -level component (15 credits) can.

Required basic core courses, required core courses and elective courses

All structural PhD students will be expected to complete similar coursework to what is listed under the MS program coursework requirements for the specialization in Structural Engineering. Please refer to the course requirements for MS students in this document.

Minor

All structural engineering PhD students are encouraged but not required to have a minor in a closely related discipline. Minors selected by previous students include Mathematics, Engineering Mechanics, and Construction Engineering/Management.

Transportation Engineering

Preparatory/Undergraduate core courses

Although an undergraduate degree in civil engineering is not required as a prerequisite to the PhD program in transportation engineering, students who do not have a BS in civil engineering will normally be required to complete those undergraduate courses that provide appropriate background. Required undergraduate preparation would generally include mathematics through differential equations and an introductory course in statistics (e.g., STAT380 at UNL) or an equivalent. A general introductory course in transportation (e.g., CIVE 361 at UNL) and one in a specific area (i.e., traffic engineering, highway design, and transportation planning) are also desirable. While 300 (junior)-level courses cannot count toward the program requirements, a limited number of 400 (senior)-level classes with a corresponding 800 -level component can (15 credits) can.

Required basic core courses, required core courses and elective courses

All transportation PhD students will be expected to complete similar coursework to what is listed under the MS program coursework requirements for the specialization in Transportation Engineering. Please refer to the course requirements for MS students in this document.

Minor

All transportation PhD students are encouraged but not required to have a minor in a closely related discipline. Minors selected by previous students include Statistics and Computer Science & Engineering.

Water Resources Engineering

Preparatory/Undergraduate Core Courses

Although an undergraduate degree in Civil Engineering is not required as a prerequisite to the PhD program in Civil Engineering with a specialization in Water Resources Engineering, students who do not have a BS in Civil Engineering will be required to complete those undergraduate courses that provide appropriate background for PhD study in Water Resources Engineering. Required undergraduate preparation would include:

- all of the mathematics required in the Civil Engineering undergraduate program (i.e., mathematics through differential equations),
- all physics required in the Civil Engineering undergraduate program
- engineering statics
- engineering dynamics
- an introductory course in statistics
- fluid mechanics
- an introductory course in water resources engineering

Required basic core courses, required core courses and elective courses

All water resources PhD students will be expected to complete similar coursework to what is listed under the MS program coursework requirements for the specialization in Water Resources Engineering. Please refer to the course requirements for MS students in this document.

Examination Requirements

All specializations have a qualifying exam requirement in addition to the comprehensive and final exam requirements. These exams are described below.

Qualifying Examination

The Department of Civil Engineering gives a Ph.D. qualifying exam to doctoral students with the dual purposes of: 1) identifying any admitted doctoral students who seem not to be qualified for doctoral studies in terms of either technical competence or aptitude for research, and 2) identifying weaknesses in student preparation that should be remedied by taking appropriate course work. It is understood that identification of an unqualified student should be rare, and that it may be considered to reflect a deficiency in the admissions process.

The qualifying exam must generally be taken within the first year of a student's PhD program (generally within the first 20 hours of graduate course work, not including transfer credits). Delays are approved only in unusual circumstances, such as a student who spends the first semester taking only or primarily undergraduate prerequisite courses or English language proficiency courses. Generally the exam is given two times per year. The graduate faculty of each specialty will announce to all students needing to take the qualifying exam the scheduled date of the qualifying exam at least four weeks in advance of the exam.

Each specialization gives a qualifying examination specific to students in that specialization. The format of all qualifying exams is as follows: The student first sits for a written exam that is at least four hours long. The discipline group will decide whether an oral exam is required, and, if so the format of that oral exam. It is expected that the qualifying exam for each specialization will be

administered by the graduate faculty members in that specialization. There are generally three possible outcomes for any given student who is taking the qualifying exam for the first time:

1) Pass,
2) Pass with the qualification that certain courses must be taken to remedy deficiencies in background preparation, and
3) Failure, with the option of retaking the exam one semester later, or at an alternate date mutually agreed upon by the student and the faculty. A failure on the second attempt is considered final and the student is removed from the graduate program.

A decision about the student's success or failure on the qualifying exam is made based on the student's performance on the written and the oral exam *(if part of the qualifying exam)*. Please note that the student has the right to appeal a termination decision related to the qualifying exam. Please refer to Section of Policy on Appealing a Dismissal in this handbook.

It is the responsibility for the advising professor to report to the Graduate Chair the outcome of the qualifying exams. This should be done by email with a carbon copy to the Graduate Secretary.

When the student has passed the comprehensive examination and removed any provisional admission requirements, the student's supervisory committee will recommend to the Office of Graduate Studies the doctoral student's admission to Candidacy by filing the Application for Admission to Candidacy for the doctoral degree, noting the dates of completing the comprehensive examination.

Dissertation Requirements

The dissertation is of no fixed length. It should treat a subject from the Candidate's special field, approved by the supervisory committee. It should show the technical mastery of the field and advance or modify former knowledge, i.e., it should treat new material, or find new results, or draw new conclusions, or it should interpret old material in a new light. Each candidate for the degree shall submit with the dissertation an abstract of the same, not exceeding 350 words in length including the title. Guidelines for dissertation preparation are available on the Office of Graduate Studies Web site. For specific formatting guidelines, the Guidelines should be consulted.

Final Examination

The final examination for the doctoral degree is oral and open to members of both the University community and the public. During the dissertation presentation and general questioning all persons may be present. However, at the end of the public hearing there will be a closed questioning portion of the examination where all persons except the Candidate, doctoral supervisory committee, and invited faculty must be excused. It is given by the supervisory committee after the Candidate's studies have been completed and the dissertation accepted. The committee also determines its character and length. The examination may be devoted to the special field of the dissertation or to the Candidate's general knowledge, or it may be designed to test judgment and critical powers.

Two weeks prior to the date scheduled for the final exam, an announcement is prepared by the Candidate. This announcement should include: the dissertation title; the name of the Candidate and the Chair/Co-Chair of the Candidate's committee; a short (approximately 250 word) abstract; and the time, date and location of the oral examination. This announcement is sent to the Civil Engineering Graduate Chair and copied to the Graduate Secretary for dissemination to all CE faculty and students.

The final oral examination for the PhD will not be scheduled unless a majority of the supervisory committee, including the chair, are available for the examination. Exceptions may be made only by permission of the Dean of Graduate Studies. In any event, the supervisor of the dissertation must have seen and approved the completed dissertation before the examination will be scheduled. An Application for Final Oral Exam must be filed two weeks prior to the scheduled defense. The advisor and two readers must sign the form prior to submission.

The committee reports the results of the final oral examination to the Office of Graduate Studies.

In the event that members of an oral examining committee are not unanimous regarding passing a Candidate, the student is to be approved for the degree if only one examiner dissents. However, in each case, the dissenting member of the committee will be expected to file a letter of explanation in the Office of Graduate Studies.

If a student fails to pass the final oral examination for an advanced degree, his/her committee must file a report on the failure in the Office of Graduate Studies and indicate what the student must do before taking another examination. Another examination may not be held during the same semester or the same summer session in which the student failed. Please note that the student has the right to appeal a termination decision related to the final examination. Please refer to Section of Policy on Appealing a Dismissal in this handbook.

PART IV: ASSISTANTSHIPS AND OTHER FINANCIAL SUPPORT

At the University of Nebraska-Lincoln, Graduate Research Assistantships (GRAs) and Graduate Teaching Assistantships (GTAs) may be available to qualified students. Students funded with fellowships and as GRAs are typically Option I MS students or PhD students. Student researchers may also be funded as GTAs for a portion of their MS and/or PhD work. As a matter of professional development and preparation for academic careers, PhD students are typically *required* to serve as GTAs for at least one course.

International students that have not completed a previous degree in the United States are ***required*** to *satisfactorily complete* the Institute for International Teaching Assistantships workshop prior to assuming the role, responsibilities, and benefits of a graduate teaching assistant. More information is available here:
http://www.unl.edu/gradstudies/current/ita

It is recommended that international PhD students complete the IITA training as soon as possible upon arrival to facilitate later appointments as GTAs and completion of their PhD program of study. A description of each type of assistantship and the criteria for selection are provided in the following sections.

Graduate Research Assistantships

Graduate research assistantships are available for graduate study in Civil Engineering. These assistantships are provided from an external grant or departmental or university funds to enable a student to work towards the advanced degree. Students receiving research assistantships may be expected to provide their academic adviser with a written report of their academic progress at the conclusion of the period for which the research assistantship is awarded. Work required by the graduate research assistantship that is not directly related to the student's own program shall not exceed 13-20 hours per week (.33 to .49 FTE). Decisions on graduate research assistantships are made on a case-by-case basis by individual faculty members. Graduate research assistants are typically expected to produce a thesis or dissertation, and also typically at least one peer-reviewed journal article during a MS and three peer-reviewed journal articles during a PhD program. Production and presentation of papers and/or posters for national and international conferences and symposia are also commonly expected during a research-based graduate program.

Graduate Teaching Assistantships

A teaching assistantship provides a stipend to a student who is typically required to spend 13-20 hours per week (.33 to .49 FTE) during the academic year assisting in the teaching program of a department. The teaching assistant is expected to continue working towards the advanced degree while being a teaching assistant.

The Graduate Council recommends, and the Department of Civil Engineering requires, that graduate teaching assistants participate in an annual campuswide workshops for graduate teaching assistants: http://www.unl.edu/gtaworkshops/home

Teaching assistants should familiarize themselves with the GTA Handbook prior to assuming responsibilities for their teaching assistantship:
http://www.unl.edu/gtahandbook/handbook-intro

Additional resources for graduate teaching assistants are available at:
http://www.unl.edu/gradstudies/current/news/resources-graduate-teaching-assistants

Graduate teaching assistants intending to pursue a career in academia are also *strongly encouraged* to avail themselves of the Teaching Documentation Program:
http://www.unl.edu/gradstudies/current/teaching/tdp

Graduate assistants may be expected to provide their academic adviser with a written report of their academic progress at the conclusion of the period for which the teaching assistantship is awarded.

Because of the potential for the exploitation of graduate students, any assignment of responsibilities, such as teaching a course, must be associated with a fair and reasonable compensation. This principle precludes a graduate student from "volunteering" for any significant service to the department without an appropriate stipend.

In the Department of Civil Engineering, selection of students to receive graduate teaching assistantships is made by the Department Chair in consultation with the department faculty. Selection of students to serve as graduate teaching assistants is typically made in the spring for the following academic year.

Other fellowship and scholarship opportunities
Other UNL or externally-funded scholarships or fellowships may be available to qualified students. Current information about UNL and externally-funded fellowships is available at:
http://www.unl.edu/gradstudies

Students holding fellowships receive advising similarly to those holding assistantships. Fellowship recipients are selected based on excellence of merit and are implicitly expected to be productive in their work through self-motivation. However, continued disbursements from the fellowship during the award period carry no contingency for time or productivity. No additional work is required of a fellow commensurate with an equivalent research assistantship stipend.

Academic Leave of Absence
An Academic Leave of Absence may be granted to students for illness or injury, to provide care or assistance for family and dependents, to meet military service obligations, or for other personal reasons. Current information about UNL academic leave for graduate students is available at: http://www.unl.edu/gradstudies/bulletin/leave

Vacation Policy for Students on Assistantships
All vacations and leaves must be planned in advance and approval obtained from your graduate advisor. There are many times when a student's presence is absolutely necessary for the proper conduct of research. Conflicts can be avoided by careful and advanced planning. School breaks such as Christmas, Thanksgiving, and Spring Break are work periods, except for days declared as official University holidays. When going on vacation or leave, a telephone number and/or address should always be left with your graduate advisor.

PART IV: ACADEMIC INTEGRITY AND PROFESSIONAL DEVELOPMENT

Graduate Student Evaluation

The Civil Engineering Graduate Faculty is committed to UNL's Guidelines for Good Practice in Graduate Education, available at:

https://catalog.unl.edu/graduate-professional/graduate/general/guidelines/

This document states that "Graduate student progress toward educational goals at the University of Nebraska is directed and evaluated by an advisor, the relevant graduate committee, and the student's supervisory committee." It also states that faculty "Not impede a graduate student's progress and completion of his/her degree in order to benefit from the student's proficiency as a teaching or research assistant."

All GTAs will be evaluated annually according to CIVE guidelines to ensure they are making satisfactory progress towards their degree. A copy of the CIVE department's review forms for instructors and students is provided in an Appendix to this document.

In addition, all graduate students in the Department of Civil Engineering will undergo a yearly evaluation with their advisor, with the evaluation form to be filed with the Graduate Secretary. The annual review forms for MS and PhD students are provided in an Appendix. The Graduate Chair will review the annual review forms. If unsatisfactory progress is noted by the student or their advisor, the Graduate Chair may convene a meeting of the student, the graduate advisor, the Graduate Chair and/or the Department Chair to determine how the Department can address the situation. In addition, the outcomes of the annual evaluation will be used in selection of future GTA and GRA appointments.

Grading of Thesis and Dissertation Hours

Thesis and dissertation hours are graded on an XP/IP basis with an IP grade indicating that satisfactory progress was made during the semester, while an XP grade indicates that unsatisfactory progress was made during the semester. The decision regarding whether to assign a grade of XP or IP to a student registered for thesis or dissertation hours rests solely with the graduate faculty advisor and is based on research expectations discussed with the student. It is the responsibility of the CIVE graduate faculty advisor to ensure that XP/IP grades for thesis/dissertation hours and the student's annual evaluation are consistent. If 2 consecutive XP grades are given to a Civil Engineering graduate student, the Graduate Chair will contact the graduate student, faculty advisor, and Department Chair, requesting a meeting to discuss the student's performance.

Policy on Incompletes

If a student accumulates more than 3 'incomplete' grades in courses other than thesis and dissertation hours, the graduate advisor will meet with the student to discuss the student's performance. Any concern raised in the meeting should be included in the student annual evaluation form. If at the end of the additional semester the student still has more than 3 'incomplete' grades, the Graduate Chair will contact the graduate student, faculty advisor, and Department Chair, requesting a meeting to discuss the student's performance.

Policy on Appealing a Dismissal
A student can appeal a decision on dismissal. The university has established appeal processes for student appealing process.
http://www.unl.edu/gradstudies/bulletin/graduate-student-program-appeals

Professional Development
Graduate students are encouraged to discuss discipline-specific professional development questions, such as joining professional societies and the job application process with their graduate advisor and supervisory committee members.

Graduate students are encouraged to present their research findings at the annual Graduate Student Research Poster Fair hosted by the UNL Office of Research. The Department of Civil Engineering offers travel grants to support civil engineering graduate students to present their research at professional conferences. The College of Engineering also maintains a Graduate Student Conference Travel Grant program. http://engineering.unl.edu/graduate-programs/graduate-student-travel/

Advanced graduate students are encouraged to take advantage of a series professional development opportunities provided by Career Services.
http://www.unl.edu/careers/about/events.shtml. For advanced doctoral students interested in pursuing a faculty position, graduate studies offer a Preparing Future Faculty program.
http://www.unl.edu/gradstudies/current/pff . The Office of Research and Economic Development offers an annual grant writing seminar: http://research.unl.edu/grant-writing-seminar/

The Department of Civil Engineering offers outstanding thesis and dissertation awards to recognize outstanding achievement of graduate students. In addition, college awards and university awards are available.
http://engineering.unl.edu/graduate-programs/graduate-student-recognition/

Responsible Use of University Resources
All graduate students are expected to use all computing resources responsibly and are expected to adhere to policies as set forth by the university and laws and regulations of federal, state and local government. These policies pertain to all computers, printers, networks, Internet connections, and communication systems transmitting voice, data, or video information owned or leased by the University of Nebraska-Lincoln. Appropriate use is always ethical, reflects academic honesty, the security and confidentiality of personal information, and shows restraint in the consumption of shared resources. Current UNL computer use policies are available at http://www.unl.edu/ucomm/compuse.

The Department of Civil Engineering owns and maintains equipment for teaching and research. It is the responsibility of each graduate student to be trained in proper use and maintenance of this equipment. It is also imperative that logs are signed and any problems noted. Individual laboratories are liable for repair and replacement costs if their personnel misuse equipment. Phone use in the department is restricted to business calls only. Occasional local personal calls are permitted, but personal long-distance and international calls are strictly prohibited. It

should be noted that graduate students working in University-sponsored Centers such as the Nebraska Transportation Center should follow any responsible use policies set forth by the Center.

APPENDIX – EVALUATION OF GRADUATE STUDENTS

Civil Engineering
University of Nebraska-Lincoln
Annual Progress Report for Master's Students – Due May 1

Student's Name _____ Academic Advisor _____

Portion Completed by the Student

Academic Progress
A copy of your unofficial transcript and your memorandum of courses should be attached to this report.

Date of entrance into program* _____ Expected completion date _____

*If admitted under provisional status, date provisional status removed _____

Date of most recent contact with your academic advisor _____

Type of degree sought
- ☐ Option I (thesis, optional minor option)
- ☐ Option II (non-thesis, required minor option)
- ☐ Option III (non-thesis, no minor option)

For Option I students:
Month & year or expected month & year of thesis proposal approval, if applicable _____
Month & year or expected month & year of thesis defense _____

For Option II and III students:
Month & year or expected month & year of comprehensive exam _____

Current GPA _____ Number of credits with a grade of B- or lower _____

Professional Performance and Potential

The student should prepare and attach the following information:
1. Current year's professional goal statement noting both academic and career goals
2. Next year's professional goal statement noting both academic and career goals
3. Resume/Vitae which may include the following
   a. Education background
   b. Employment background
   c. Papers published or submitted
   d. Presentations at professional conferences
   e. Other relevant information

Comment briefly on your progress in achieving your academic goals during the past year. Note areas in which you are experiencing any difficulty.

Comment briefly on your progress toward achieving your career goals during the past year. If you feel you are not making progress, explain why.

Civil Engineering
University of Nebraska-Lincoln
Annual Progress Report for Master's Students – Due May 1

Student's Name _____ Academic Advisor _____

Portion Completed by the Academic Advisor
Academic Progress

1. Has the student made acceptable progress during the evaluation period? Please comment below.

2. Please comment on the overall academic performance of the student, including teaching assistant experiences, if applicable (if the student served as a GTA for another faculty member, that faculty member's input on GTA performance should be included. Attach this year's departmental GTA review forms.)

Student Your signature below indicates that you have discussed the contents of this progress report with your academic advisor.

Student _____ Date _____

Academic Advisor Your signature below indicates that you have discussed the contents of this progress report with the student.

Academic Advisor _____ Date _____

Graduate Chair Your signature below indicates that you have received this progress report and have asked for it to be filed in the student's file.

Graduate Chair _____ Date _____

When the academic advisor and student have reviewed and signed this progress report and submitted it to the Graduate Chair, copies of the report must be given to the student and academic advisor. The original progress report must be placed in the student's file in the departmental office. Students have the option to discuss any part of the academic advisor's evaluation with the department graduate committee.

Civil Engineering
University of Nebraska-Lincoln
Annual Progress Report for PhD Students – Due May 1

Student's Name _____ Academic Advisor _____

Portion Completed by the Student

Academic Progress

A copy of your unofficial transcript and your program of courses should be attached to this report.

Date of entrance into program* _____ Expected completion date _____

*If admitted under provisional status, date provisional status removed _____

Date of most recent contact with your academic advisor _____

Month & year or expected month & year of qualifying exam _____ Passed? _____
Month & year or expected month & year of comprehensive exam_____ Passed? _____
Month & year or expected month & year of final oral exam _____

Current GPA _____ Number of credits with a grade of B- or lower _____

Professional Performance and Potential

The student should prepare and attach the following information:

1. Current year's professional goal statement noting both academic and career goals
2. Next year's professional goal statement noting both academic and career goals
3. Resume/Vitae which may include the following
   a. Education background
   b. Employment background
   c. Papers published or submitted
   d. Presentations at professional conferences
   e. Research participation
   f. Service participation
   g. Education participation (e.g., courses taught, grading, mentoring)
   h. Other

Comment briefly on your progress in achieving your academic goals during the past year. Note areas in which you are experiencing any difficulty.

Comment briefly on your progress toward achieving your career goals during the past year. If you feel you are not making progress, explain why.

Civil Engineering
University of Nebraska-Lincoln
Annual Progress Report for PhD Students – Due May 1

Student's Name _____ Academic Advisor _____

Portion Completed by the Academic Advisor

Academic Progress

1. Has the student made acceptable progress during the evaluation period? Please comment below.

2. Please comment on the overall academic performance of the student, including teaching assistant experiences, if applicable (if the student served as a GTA for another faculty member, that faculty member's input on GTA performance should be included. Attach this year's departmental GTA review forms.)

Student Your signature below indicates that you have discussed the contents of this progress report with your academic advisor.

Student _____ Date _____

Academic Advisor Your signature below indicates that you have discussed the contents of this progress report with the student.

Academic Advisor _____ Date _____

Graduate Chair Your signature below indicates that you have received this progress report and have asked for it to be filed in the student's file.

Graduate Chair _____ Date _____

When the academic advisor and student have reviewed and signed this progress report and submitted it to the Graduate Chair, copies of the report must be given to the student and academic advisor. The original progress report must be placed in the student's file in the departmental office. Students have the option to discuss any part of the academic advisor's evaluation with the department graduate committee.