



*Civil and Environmental Engineering
Graduate Program*

**Program Information Manual for
Graduate Students**

**Academic Year
2009-2010**

Preface

This manual is intended to augment the sections of the Graduate School Bulletin dealing with academic policies and procedures and degree requirements. The student is urged to read the Graduate School Bulletin carefully since all the vital information is not repeated herein. It is the student's responsibility to be aware of the current requirements of the Graduate School.

This Manual also constitutes part of the Program Bylaws.

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SECTION I: Master of Science

A) Degree Options

The Master of Science degree requires the completion of at least 30 credits under two options:

Option A: Requires a minimum of **24** credits of coursework plus a 6 credit thesis and a public oral defense of thesis.

Option B: Requires a minimum of **27** credits of coursework plus a **3** credit special project, and a final oral examination.¹

Students are free to choose between Options A and B, except graduate assistants, who are required to take Option A. The students choose a program of study outlined in **Section III**.

B) General Course Credit Requirements

Students must satisfy the following credit requirements toward the M.S. degree:

1. At least **18** credits must be taken from the Department of Civil and Environmental Engineering.
2. No credit in 300-level courses may be used toward the M.S. degree.
3. No more than **6** credits of 400-level Civil and Environmental engineering courses may be used toward the M.S. degree². *Special Problems in Civil Engineering and Co-Op Courses* cannot be used toward the MS Degree.
4. No more than **3** credits of either *Advanced Topics In Civil Engineering (180:601 or 180:602)* **or** *Advanced Topics in Environmental Engineering (180:611 or 180:612)* may be used toward the M.S. degree.
5. 180:701 and 180:702 can be used only for thesis research. These credits will not count toward coursework requirements.
6. At least **two** semesters (N credit prefix) of *Seminar in Civil and Environmental Engineering (180:691, 180:692)*

¹ As per the Graduate School's requirement, he/she must demonstrate that he/she has the ability to write a creditable report as part of a regular course

² Courses approved by graduate director

C) Scholastic Standing

Candidates for the M.S. degree shall have a GPA of 3.0 or better in their coursework. No more than **6** credits bearing the grade of C or C+ may be used to meet the requirements for the M.S. degree. His/her advisor monitors the student's academic performance. The students may be recommended for dismissal from the Graduate School by action of the graduate faculty.

D) M.S. Committee

The student's graduate committee will normally consist of three graduate program faculty members. The student's advisor will serve as chairperson. The graduate director upon the recommendation of the student's advisor will appoint members to the student's committee. The advisor will consult with the student on this matter. The graduate director in consultation with the advisor and the student will make any subsequent changes of committee members.

Option A: The committee will be appointed during the term in which the student commences his/her thesis research. Before embarking on the research, the student will submit a short proposal of the thesis work to his/her committee. The committee will be responsible for supervising the thesis research and conducting the public oral defense of thesis.

Option B: The committee will be appointed at the start of the semester in which the student will take his/her final oral examination. The student will work on a 3-credit project with his/her advisor and submit a scholarly report. The final oral examination is based on the work done in the project. The committee will be responsible for conducting the final oral examination.

E) Final Oral Examination

The final oral examination will be conducted by the student's committee near the end of the student's final term of work. The examination will consist of an oral presentation of the thesis or project report.

The student must bring with him/her the form *Application for Admission to Candidacy for Degree of M.S.* to the examination. The form must have been previously filed with the Graduate School early in the semester in which the student expects to take the examination. After the examination, the student will return the properly signed form to the Graduate School. One dissenting vote is allowed to pass a candidate for the degree. Students who fail the final examination will be given the opportunity to retake the examination for a second and final time within one year of the first attempt.

F) Continuing to the Ph.D. Program

Students who completed the department's M.S. degree requirements and are interested in continuing to the doctoral program should file an application with the graduate director. Normally, the student is expected to have a grade point average of at least 3.5 in the M.S. coursework and must be recommended by the M.S. committee members. It is desirable for the student to have a professor who agrees to supervise the student's doctoral research. The student's M.S. committee will review the application and make a recommendation to the graduate director for approval.

G) Time Limits

Students are urged to complete the M.S. requirements as expeditiously as possible. The normal maximum is three years after the first registration in the Graduate School.

Part-time students will be allowed, without petitioning, a normal maximum of five years.

Students requiring an extension beyond the normal time limits must petition, through the graduate director, to the Executive Council of the Graduate School on an appropriate form available from the Graduate School. The extension will be granted provided that the petition is supported by the student's satisfactory progress in his/her work and other valid reasons.

SECTION II: Doctor of Philosophy

The graduate program in civil and environmental engineering offers the degree Doctor of Philosophy that requires at least **48** credits of coursework and at least **24** credits of thesis research. The doctoral program is arranged in the following two phases.

Phase 1: The student pursues courses of study and successfully completes a qualifying examination.

Phase 2: The student primarily pursues courses of research and presents results in an acceptable dissertation.

A) General Course Credit Requirements

Students must satisfy the following credit requirements toward the Ph.D. degree.

1. At least **48** credits of coursework, which may include M.S. degree coursework, plus at least **24** credits of thesis research.
2. At least **30** credits of coursework must be taken from the Department of Civil and Environmental Engineering or **15** credits if entering with 24 transfer credits.
3. No more than **6** credits of either *Advanced Topics in Civil Engineering (180:601 or 180:602)* or *Advanced Topics in Environmental Engineering (180:611 or 180:612)*.
4. No credit in 300-level courses and no more than **9** credits in 400-level courses may be used toward the **48** credits of required coursework.
5. At least **18** credits must be in courses within his/her major area of discipline.
6. At least **four** semesters (N credit prefix) of *Seminar in Civil and Environmental Engineering (180:691, 180:692)*.
7. At least **6** credits in the area of mathematics, numerical methods and statistics are required. Suggested courses in Applied Mathematics and Statistics are as follows:

Applied Mathematics

198:510	Numerical Analysis
642:516	Applied Partial Differential Equations
642:527,528	Methods of Applied Mathematics
642:550	Linear Algebra and Applications
642:573	Numerical Analysis
642:574	Numerical Analysis
642:575	Numerical Solutions of Partial Differential Equations
642:577,578	Selected Mathematical Topics in System Theory
642:581	Applied Graph Theory

Statistics

960:401	Basic Statistics for Research	(G3)
960:463	Regression Methods	(G3)
960:467	Applied Multivariate Analysis	(G3)
960:476	Introduction to Sampling	(G3)
960:484	Basic Applied Statistics	(G3)
960:486	Interpretation of Data	(G3)
960:490	Introduction to Experimental Design	(G3)
960:501	Statistical Theory for Research Workers I	
960:502	Statistical Theory for Research Workers II	
960:555	Nonparametric Statistics	
960:563	Regression Analysis	
960:590	Design of Experiments	
960:654	Stochastic Processes	

B) Scholastic Standing

Students enrolled in the Ph.D. program are expected to have a GPA of 3.5 or better in their coursework. No more than **9** credits bearing the grade of C or C+ may be used to meet the requirements for the Ph.D. degree. His/her advisor monitors the student's academic performance. The students may be recommended for dismissal from the Graduate School by action of the faculty of the graduate program.

C) Admission To Ph.D. Candidacy

The student becomes a Ph.D. candidate upon passing a qualifying examination. He/she is strongly urged to take the qualifying examination as soon possible, but no later than two academic semesters after completion of his/her M.S. course requirements. The qualifying examination is composed of a written examination followed by an *oral* examination. The *oral* examination must be taken within one semester of passing the *written* examination.

- 1. Written Examination:** This examination must be taken by the student no later than **two** academic semesters after completion of his/her M.S. course requirements and will normally be offered twice during the academic year (last Monday of October and March). The student who intends to take the examination must inform the Graduate Director at least one month before the examination date.

The *written* examination consists of a 3-hour closed book written examination to be taken in the morning, followed by a 2-hour afternoon

presentation and discussion of the written exam. The examination is given by a committee made up of at least two faculty members from the student's area of major study and at least one from an area other than the student's major area. The graduate director in consultation with the student's advisor appoints the committee. Students are encouraged to consult with the committee members on the subject area of their examinations. Test results will be announced to the student within one week of the examination date. Students are permitted one re-examination within the time period of no later than three months after the first examination.

2. **Oral Examination:** This examination must be taken within one semester of passing the *written* examination. The student will submit a short thesis proposal to his/her Ph.D. committee one week prior to the *oral* examination. The student must bring with him/her the form "Application for Admission to Candidacy for the Degree of Doctor of Philosophy" obtainable from the Graduate School. The examination will cover the proposed research. One dissenting vote is allowed to pass the student in his/her *oral* examination. After the examination, the student will return the candidacy form, properly signed by the committee, to the Graduate School. Approval of this form represents admission to Ph.D. candidacy. Students are permitted one re-examination within one month after the initial oral examination.

D) Ph.D. Committee

The graduate director, in consultation with the student's advisor, during the time interval between the written and oral qualifying examinations, will appoint the student's Ph.D. committee. The committee will be responsible for conducting the oral qualifying examination, for supervising the thesis research, and conducting the public thesis defense.

The committee will consist of at least four faculty members, with the student's advisor as chairperson. At least one of the committee members will be from outside of the program of civil and environmental engineering. A majority of the committee members must be chosen from within the program.

E) Public Defense Ph.D. Thesis Defense

This public examination covers the student's Ph.D. research work and thesis. His/her Ph.D. committee will conduct it. One dissenting vote is allowed to pass the student for the degree. At the time of the examination, it is the responsibility of the candidate to retrieve from the Office of the Graduate School his/her candidacy application (on which the results of the qualifying examination appear) and submit it to the chairperson of his/her committee. The student must return this form properly signed by the committee to the Graduate School along with the required original copy of his/her thesis and other materials (see the Graduate School catalog).

In order to prepare and distribute appropriate announcements, the graduate director must be informed of the thesis title, the date, and time of the thesis defense at least ten days in advance by the chairperson of the committee.

F) Time Limits

Students are urged to complete the Ph.D. requirements as expeditiously as possible. The normal maximum for a student entering the program with a B.S. degree is seven years after the first registration in the Graduate School. The normal maximum for a student entering the program with a M.S. degree is six years after the first registration in the Graduate School. Part-time students will be allowed, by petitioning the Graduate School, a time extension of one to three years beyond the normal limits given above.

Students requiring an extension beyond the normal time limits must petition the graduate director and the Executive Council of the Graduate School on an appropriate form available from the Graduate School. The extension will be granted provided that the petition is supported by the student's satisfactory progress in his/her work and other valid reasons.

SECTION III: Programs of Study

The Department of Civil and Environmental Engineering offers the following specialties: (a) Construction Engineering, (b) Geotechnical Engineering, (c) Structures, (d) Transportation, (e) Water Resources and Environmental Engineering. In addition, The Department is offering in collaboration with other graduate programs two graduate certificate programs in (a) Engineering Geophysics and (b) Transportation Studies.

A) Specialty Requirements

Students in the M.S. and Ph.D. programs are required to choose a specialty. For each specialty in the graduate program the student is required to take:

- M.S.**
- At least four departmental courses in their area of specialty
 - At least two departmental electives outside of their specialty

- Ph.D.**
- At least 18 courses must be in courses within major area of discipline

Students interested in taking course outside of the department are strongly encouraged to consult the list of suggested courses listed in **Section III-C** of this manual.

B) Departmental Courses Listed by Specialties

Construction Engineering

- 180:516 *Advanced Structural Design* (3)
- 180:541 *Advanced Reinforced Concrete* (3)
- 180:545 *Advanced Construction Engineering Management* (3)
- 180:546 *Advanced Construction Engineering Management II* (3)
- 180:561 *Advanced Water Supply and Sewerage* (3)
- 180:562 *Design of Water and Wastewater Treatment* (3)
- 180:572 *Soils Engineering* (3)
- 180:577 *Advanced Foundation Engineering* (3)

Geotechnical Engineering

- 180:535 *Mechanistic Pavement Design* (3)
- 180:571 *Advanced Soil Mechanics* (3)
- 180:572 *Soils Engineering* (3)
- 180:574 *Groundwater Engineering I* (3)
- 180:575 *Theoretical Soils Mechanics* (3)
- 180:576 *Groundwater Engineering II* (3)
- 180:577 *Advanced Foundation Engineering* (3)
- 180:578 *Soil Dynamics* (3)
- 180:579 *Environmental Management of Maritime Infrastructure* (3)
- 180:580 *Engineering Rock Mechanics* (3)
- 180:581 *Physiochemical Properties and Stabilization of Soils* (3)
- 180:582 *Dynamic Soil Structure Interaction and Earthquake Eng* (3)

Structures

Students in the structures program are required to take 180:516 and 180:541

- 180:514 *Composite Materials in Civil Engineering* (3)
- 180:515 *Structural Analysis* (3)
- 180:516 *Advanced Structural Design* (3)
- 180:517 *Structural Dynamics* (3)
- 180:518 *Design for Lateral Loads* (3)
- 180:519 *Advanced Structural Analysis* (3)
- 180:522 *Finite Element Methods in Civil Engineering* (3)
- 180:523 *Structural Optimization* (3)
- 180:524 *Bridge Design I* (3)
- 180:525 *Structural Reliability* (3)
- 180:526 *Structural Stability* (3)
- 180:527 *Bridge Design II* (3)
- 180:541 *Advanced Reinforced Concrete* (3)
- 180:542 *Advanced Reinforced Concrete II* (3)
- 180:544 *Prestressed Concrete* (3)
- 180:553 *Bending and Buckling of Plates and Shells* (3)

Transportation

- 180:530 *Maritime Transportation* (3)
- 180:531 *Traffic Engineering* (3)
- 180:532 *Transportation Planning* (3)
- 180:533 *Traffic Operations* (3)
- 180:534 *Design of Transportation Facilities* (3)
- 180:536 *Transportation Systems Analysis* (3)
- 180:537 *Intelligent Transportation Systems* (3)
- 180:538 *Freight Transportation Systems* (3)
- 180:579 *Environmental Management of Maritime Infrastructure* (3)

Water Resourced and Environmental Engineering

- 180:561 *Advanced Water Supply and Sewerage* (3)
- 180:562 *Design of Water and Wastewater Treatment* (3)
- 180:563 *Advanced Hydrology* (3)
- 180:564 *Unit Processes in Environmental Engineering* (3)
- 180:565 *Biogeochemical Engineering* (3)
- 180:566 *Sediment Transport* (3)
- 180:567 *Analysis of Receiving Water Quality* (3)
- 180:568 *Thermal Effects of Receiving Waters* (3)
- 180:574 *Groundwater Engineering I* (3)
- 180:576 *Groundwater Engineering II* (3)
- 180:579 *Environmental Management of Maritime Infrastructure* (3)
- 180:586 *Advanced Fluid Mechanics* (3)
- 180:588 *Theory of Hydraulic Models* (3)
- 180:590 *Coastal Engineering* (3)

C) Suggested Courses Outside of the Department

Computer Sciences

- 198:510 *Numerical Analysis* (3)
- 198:521 *Linear Programming* (3)
- 198:527 *Computer Methods for Partial Differential Equations* (3)

Ecology and Evolution

- 215:506 *Estuarine Ecology* (4)

Environmental Sciences

- 375:509 *Groundwater Pollution* (3)
- 375:525 *Principles of Solid Waste Management & Treatment* (3)
- 375:530 *Hazardous Waste Management* (3)
- 375:531 *Biological Waste Treatment* (3)
- 375:533 *Water Law* (3)
- 375:541 *Environmental Models* (3)

Geological Sciences

- 460:408 *Geomorphology* (3)
- 460:516 *Advanced Structural Geology* (3)
- 460:555 *Geophysics I* (3)
- 460:556 *Geophysics II* (3)

Industrial Relations and Human Resources

- 545:610 *Selected Problems in Industrial Relations* (3)

Industrial and Systems Engineering

- 540:510 *Deterministic Models in Industrial Engineering* (3)
- 540:515 *Stochastic Models in Industrial Engineering* (3)
- 540:522 *Operations Research* (3)
- 540:530 *Forecasting and Time Series Analysis* (3)
- 540:535 *Graph Theory & Networks in Industrial Engineering and Operations Research* (3)
- 540:575 *Advanced Engineering Economics* (3)

Labor and Industrial Relations

- 578:521 *New Directions In Collective Bargaining*

Applied Mathematics

- 642:516 *Applied Partial Differential Equations* (1)
- 642:527,528 *Methods of Applied Mathematics* (3)
- 642:550 *Linear Algebra and Applications* (3)
- 642:573,574 *Numerical Analysis* (3)
- 642:575 *Numerical Solutions of Partial Differential Equations* (3)
- 642:588 *Introduction to Mathematical Techniques in Operations Research* (3)

Mechanical and Aerospace Engineering

- 650:529 *Random Vibration* (3)
- 650:531 *Advanced Mechanics of Materials* (3)
- 650:540 *Fluid Mechanics* (3)
- 650:571 *Introduction to Mechanics of Continua* (3)
- 650:572 *Theory of Elasticity* (3)
- 650:573 *Theory of Plasticity and Applications* (3)
- 650:575 *Finite Element Methods in Solid Mechanics* (3)
- 650:577 *Mechanics of Composite Materials* (3)
- 650:585 *Fracture Mechanics* (3)
- 650:588 *Stress Waves in Solids* (3)

Mechanics

- 654:583 *Advanced Theory of Elasticity* (3)

Oceanography

- 712:501 *Physical Oceanography*
- 712:615 *Geophysical Data Analysis*

Statistics

- 960:401 *Basic Statistics for Research* (G3)
- 960:463 *Regression Analysis* (G3)
- 960:563 *Regression Analysis* (3)
- 960:580 *Basic Probability* (3)
- 960:582 *Introduction to Methods and Theory of Probability* (3)
- 960:590 *Design of Experiments* (3)
- 960:654 *Stochastic Processes* (3)

Management (for Construction Majors Only)

010:577 *Accounting for Managers* (3)

390:587 *Financial Management* (3)

835:578 *Management of Operations* (3)

SECTION IV: Academic Advisors

At the beginning of the first term of study, each newly admitted graduate student would be assigned a provisional academic advisor who is chosen with respect to the student's area of specialization.

The student is expected to contact the faculty members in his/her area of specialization and discuss possible topics for either a thesis or special project. This should be done for the M.S. student during the second semester and for the Ph.D. student prior to taking the qualifying examinations. The student should seek a faculty member who agrees to guide his/her thesis or special project. He/she then informs the graduate director, who will then appoint the faculty member as the student's advisor.

Subsequent changes of advisor may be made when special conditions arise. In such cases, the student must discuss the problem with his/her current advisor and the graduate director for a solution. However, students should be aware that such changes might create practical problems, such as loss of time and efforts and possible loss of support for graduate assistants. The student must file a "change of advisor" form with the graduate director.

SECTION V: Thesis

The following provisions apply to both M.S. and Ph.D. theses. The deadlines for submission of the **first** draft should be:

- 1) February 15th for May graduation
- 2) April 15th for October graduation
- 3) November 1st for January graduation

Prior to the deadlines, the **candidate** should submit copies of the **first** draft to his/her advisor for distribution to the committee members. Three copies (four copies for the Ph.D. candidate) of the **final** draft that conform to the instructions given in the pamphlet "Style Guide for Thesis and Dissertation Preparation", available from the Office of the Graduate School, should be submitted to the advisor prior to setting a date for the public thesis defense.

After the thesis defense the student may be required to make modification to his/her **final** draft. The student then submits the thesis to the graduate school, the Department, and advisor. The Graduate School requires that photocopies be

made on bonded paper. A biographical sketch, a thesis abstract not exceeding 350 words, and approval by the advisor is required by the Graduate School.

The announcement for the final examination is the responsibility of the graduate director and will be made at the request of the advisor and in consultation with all members of the committee.

Expenses for thesis preparation, including the cost of drawings, photographs, reproductions, and printing, are the sole responsibility of the student.

The advisor in consultation with the student will decide the manner or format of publication of the thesis or research results.

SECTION VI: Seminars

Since the departmental seminars are the vehicles by which the faculty and graduate students are exposed to the research activities, within and outside of the departments, M.S. students are required to complete at least two semesters and Ph.D. students at least four semesters of seminars. (180:691 or 780:692, N credit prefix).

SECTION VII: Transfer of Credits

Students will be allowed to transfer no more than **12** credits toward the M.S. degree and no more than **24** credits toward the Ph.D. degree. The transferred credits must satisfy the requirements set forth in Sections I & II.

SECTION VIII: Non-Civil Engineering Graduates

Normally, only students with an engineering degree from an ABET (*the recognized accreditor for college and university programs in applied science, computing, engineering, and technology*) institution or equivalent are admitted into the program.

Non-civil engineering graduates who are admitted into the graduate program must fulfill the following requirements, in addition to those set forth in Sections I & II.

- 1) The equivalent of the following undergraduate civil engineering courses (E graduate credit):
 - 180:243 *Mechanics of Solids*
 - 180:387 *Fluid Mechanics*
 - 180:372 *Soil Mechanics*
- 2) Students may be required to take additional undergraduate courses in their area of specialization (E graduate credit).

These requirements must be met early in the students' program. The student is expected to earn grades of B or better in the listed courses.

SECTION IX: Appeal and Grievance

A student should first discuss his/her grievance with their advisor. If the matter cannot be resolved the student may appeal to the graduate director. The graduate director shall consult with all parties involved and propose a resolution. If this is not successful, the matter shall be referred to the program faculty. Although the program faculty's decision shall normally be final, the student may further appeal to the Dean of the Graduate School.