

# REQUIREMENTS AND PROCEDURES Doctor of Philosophy in Engineering

## Department of Civil and Environmental Engineering The University of Michigan (Revised October 2015)

The goal of The University of Michigan Civil and Environmental Engineering Doctoral Programs is to prepare talented students to pursue successful professional careers in teaching, research and the practice of Civil and Environmental Engineering.

This document describes the principal requirements to be met and procedures to be followed by students pursuing the doctorate in Civil Engineering or Environmental Engineering. Basic information common to all doctoral programs at the University of Michigan is contained in the Horace H. Rackham School of Graduate Studies Graduate Student Handbook and the On-Line BULLETIN, both of which may be found at [www.rackham.umich.edu](http://www.rackham.umich.edu). Students with questions should seek the assistance of their advisors.

The Doctor of Philosophy degrees in Civil Engineering and Environmental Engineering are conferred by the Horace H. Rackham School of Graduate Studies. Before being awarded either degree, the student must satisfy both the requirements established by the Graduate School (described in the publications mentioned above), and the additional requirements of the Department of Civil and Environmental Engineering stated in this publication. The administration of the Doctor of Philosophy programs throughout The University of Michigan is the responsibility of the Dean of the Graduate School. The administration of the doctoral programs in Civil and Environmental Engineering is directed by the Department's Graduate Committee.

### SYNOPSIS OF THE PROGRAM

The program of the student seeking the Civil Engineering or Environmental Engineering doctoral degree follows the general scheme shown on the attached flow chart, which also links the milestones reached in pursuing the degree.

Upon admission to the doctoral program, the student is classified as a *Pre-Candidate*. The student follows a program supervised by a doctoral advisor in the chosen field until passing the Preliminary Examination. The student then works with his/her advisor to select a dissertation topic and dissertation committee. Upon meeting those milestones and having fulfilled the Responsible Conduct of Research and Scholarship (RCRS) requirements, the student can advance to the status of *Candidate* for the Ph.D. degree. Thereafter, the Dissertation Committee guides the Ph.D. Candidate's program through the completion of the remaining requirements of the Ph.D. program, including the Ph.D. Research Proposal Defense and the Final Dissertation Defense.

### PROGRAM REQUIREMENTS

#### Admission

Requirements for admission to the Ph.D. program are described in detail in the current Graduate School On-Line BULLETIN and the Graduate Student Handbook. Interested students should visit our admissions webpage for more information: <http://cee.umich.edu/gradadmissions>. Decisions on admission to the doctoral program are made by the Graduate School upon recommendations from the Department. These recommendations are primarily based on the student's performance in prior academic efforts.

#### Equal Opportunity

The University of Michigan complies with applicable Federal and State law prohibiting discriminating, including Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973. The University of

Michigan is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, national origin, age, marital status, sex, sexual orientation, gender identity, gender expression, disability, religion, height, weight, or veteran status. The university also is committed to compliance with all applicable laws regarding nondiscrimination and affirmative action.

### **Preliminary Program**

After admission to the status of Pre-Candidate, the student should confer with their doctoral advisor, and jointly develop a tentative, preliminary program suited to the student's career goals and consistent with the course, research, and other requirements of the Department and the Graduate School. While detailed course requirements are initially determined through this process, the final program will be guided by the student's Dissertation Committee.

### **Course Program**

The student is required to complete course work to provide an adequate background in the chosen field and to undertake thesis research effectively. At least 18 credit hours of course work beyond the Master's level must be completed, not including independent study and English language courses. No transfer credit can be counted toward this 18 hour minimum. Alternatively, for students proceeding directly to the Ph.D. degree from the Bachelor's level, or who obtain their MSE degree at the University of Michigan in the same discipline as their Ph.D., at least 39 credit hours of approved graduate course work must be completed, not including English language courses. A minimum of 45 credit hours is required, which can include up to 6 credit hours of independent study.

The Graduate School requires that at least four hours of cognate course credit be included in the student's graduate program. Cognate courses are those that are in a discipline or area different from a student's field of study but are related or connected with some aspect of this field. Courses cross-listed with the Civil and Environmental Engineering Department may satisfy the cognate requirement provided that the course is in a subfield different from the student's own. Cognate courses must be passed with a grade of B- or better. At least one course used to fulfill the cognate requirement must be at minimum 2 credit hours and, at most, 1 credit hour of a seminar course offered by a different department can be used toward meeting the cognate requirement.

The Department requires that at least one course in advanced mathematics, probability, statistics or mathematical programming be included in the student's graduate program. Math-intensive courses offered in the Civil and Environmental Department may be used to satisfy this requirement.

Courses taken at the University of Michigan toward satisfying the MSE math/cognate requirements can be used to satisfy the PhD math/cognate requirements.

A cumulative minimum GPA of B (3.0 on a 4.0 point scale) is required for all graduate work taken for credit.

### **Course Load**

The Department policy is that a typical full-time graduate student course load is 12 credit hours. Pre-Candidates who are employed in remunerative work are permitted to take a full-term course load up to the maximum indicated in the following schedule.

Full-time employment	-	6 credit hours
3/4 - time employment	-	8 credit hours
1/2 - time employment	-	10 credit hours
1/4 - time employment	-	12 credit hours

Students receiving remuneration from a University appointment are required by Department policy to elect at least six credit hours during the term of appointment.

### **Preliminary Examination and Candidacy**

The Pre-Candidate student must pass the Preliminary Examination to be considered for Candidacy. Prior to being considered for the Preliminary Examination, the Pre-Candidate student will have completed at least 18 credit hours beyond the Bachelor's degree (or 9 credits beyond an external Master's degree), have a cumulative GPA of 3.30 or better in graduate course work at the University of Michigan (excluding independent study courses), and have taken at least 3 credits of research or have served at least one term as a Graduate Student Research Assistant (GSRA).

Students must also have a GPA of 3.5 or better in CEE courses. Eligibility to take the Preliminary Examination will then be determined by the Graduate Committee after critical review and evaluation of the student's academic performance submitted by the student's academic advisor.

The Preliminary Examination will ordinarily be taken as soon as the student is eligible and should be taken no later than 13 months for students entering with a Master's degree or 17 months for students entering with a Bachelor's degree after admission as a Pre-Candidate. A student may schedule his or her Preliminary Examination during either the first week of January or during the first two weeks of May. The student's advisor may request that the examination be taken at a different time, by submitting a petition to the graduate committee.

The specific format of the Preliminary Examination will vary, depending on the student's area of specialization. Areas of specialization for the Preliminary Examination are:

- Structural and Materials Engineering
- Geotechnical Engineering
- Construction Engineering and Management
- Intelligent Systems
- Transportation Engineering
- Environmental and Water Resources Engineering

Details regarding these formats may be found at <http://www.cee.umich.edu/phdinfo>. The Preliminary Examination is administered by a Preliminary Examination Committee selected by the faculty in the student's area of specialization, and appointed by the Chair of the Graduate Committee. The Preliminary Examination Committee will contain at least four graduate faculty members, three of whom must be Civil and Environmental Engineering faculty. In all areas of specialization, the exam contains an oral component in which the student must answer questions from the Committee regarding their area of specialization.

The Preliminary Examination Committee submits its recommendation to the Graduate Chair for decision and the Graduate Chair officially informs the student of the outcome. The three possible outcomes of the Examination are: 1) Pass; 2) Defer for reexamination during the next examination window after steps have been taken to remedy deficiencies made apparent by the Examination; or 3) Fail. A student who fails the examination will not be permitted to continue work toward the Ph.D. and will be expected to terminate studies within the Department by the close of the current term or as agreed upon with his/her advisor.

### **Selection of Thesis Topic and Dissertation Committee Chair**

As soon as possible after passing the Preliminary Exam, the student should choose a thesis topic in consultation with the faculty member chosen by the student to serve as Chair of the Dissertation Committee. A faculty member with less than a 50% appointment in the Department of Civil and Environmental Engineering cannot serve as the sole Chair, but can serve as the Co-Chair provided that a faculty member with a greater than 50% appointment in Civil and Environmental Engineering is chosen as a Co-Chair.

The student's dissertation research must make a significant and important contribution to knowledge in the chosen area of specialization. However, the scope and complexity of the research should not make completion impossible within a reasonable period of time.

### **Selection and Appointment of Dissertation Committee**

The Dissertation Committee must include at least four members of the graduate faculty, including at least two from the Civil and Environmental Engineering Department and at least one from a cognate field outside the Department. A committee member may be appointed from qualified individuals not affiliated with the University of Michigan, but this person may not serve as the Cognate Committee Member. It is also necessary to file an application along with documentation describing the qualifications of any person who is not a member of the graduate faculty to obtain approval for this person to serve as a committee member.

When the Dissertation Committee has been selected and each prospective member has consented to serve, the designated Committee Chair requests that the Department recommends appointment of the Dissertation Committee by the Dean of the Graduate School.

## **Advancement to Candidacy**

After most of the course work has been completed<sup>1</sup>, the Preliminary Examination has been passed, the Responsible Conduct of Research and Scholarship (RCRS) requirement has been met, and the Dissertation Committee has been formed, the student may be advanced to candidacy upon request of the advisor through a written memo to the Graduate Committee. Students and advisors should note that after reaching candidacy, students are allowed to take only one course per semester (unless the advisor commits additional funds beyond candidate tuition). Advancement to candidacy is granted by the Dean of the Graduate School upon recommendation of the Department Graduate Committee. The written recommendation must be received at the Graduate School in accordance with published deadlines for the term for which Candidacy is requested. The student should become familiar with Graduate School time deadlines for admittance to Candidacy. The Graduate School formally recognizes this milestone in the pursuit of the Ph.D.

<sup>1</sup>This means that at least five courses at UM plus four credits of cognates have been completed. The four credits of cognates may have been taken either at the UM or within another acceptable graduate program. If the departmental math requirement has not been satisfied, the student must be enrolled in an acceptable math course during the term she/he becomes a Candidate.

## **Final Program and Scope of Thesis Research**

Soon after the Dissertation Committee has been appointed, the Candidate should arrange for a Committee meeting to present the proposed remaining course work and thesis research program for Committee approval. The Dissertation Committee may establish requirements different from those specified earlier by the doctoral advisor. Having regular Committee meetings will avoid hardships resulting from deferring decisions on the final course program and research direction changes. It is recommended that these committee meetings be organized at least once a year and consist of a presentation by the student and a follow up discussion with the committee. Ideally, all committee members are present at these meetings.

## **English Language Proficiency**

Every doctoral student must satisfy the departmental requirement of demonstrated proficiency in English writing before being advanced to candidacy. It is the responsibility of each Dissertation Committee to ensure that this requirement has been met. Certification by the Dissertation Committee Chair to the Graduate Committee that the Pre-Candidate has demonstrated proficiency in English writing will satisfy this requirement. Otherwise, this requirement must be fulfilled by the successful completion of one of the following courses:

- Technical Communications 610, *Thesis, Dissertation Proposal, and Dissertation Writing for Engineers and Scientists*, with a grade of "P",
- English Language Institute 620, *Dissertation Writing and Writing for Publication I*.

In the event that one of the above courses is used to satisfy the English proficiency requirement, the student must have taken the course previously or enroll in the course as soon as possible after advancement to Candidacy is achieved (Winter semester for January exam, Fall semester for May exam).

## **Research Proposal Defense**

The Research Proposal Defense should occur no later than 30 months after enrolling in the Ph.D. program. Students pursuing more than one degree are expected to take no longer than 36 months. The candidate prepares a written research proposal, which identifies the research problem, provides a preliminary literature review of past research related to the problem, describes the student's proposed approach to solve the problem, and includes any preliminary results that have been obtained. The research proposal must be submitted to the Dissertation Committee Chair no later than two weeks before the date of the Research Proposal Defense. If the proposal is not submitted by that date, the Research Proposal Defense may be postponed. The Research Proposal Defense will consist of a short oral presentation of the research proposal by the Candidate and an oral examination of the Candidate by the Dissertation Committee. All members of the Civil and Environmental Engineering Faculty, advanced graduate students, and postdoctoral researchers may be invited to attend the Research Proposal Defense with permission of the Dissertation Chair. A copy of the research proposal will be filed in the Dissertation Committee Chair's files.

## **Preparation and Submission of the Dissertation**

The dissertation must be prepared in a style acceptable to the Graduate School as given in its current HANDBOOK FOR DOCTORAL CANDIDATES. The several steps in the process of completion, submission and approval of the dissertation are specified in the HANDBOOK. The Dean of the Graduate School approves each dissertation.

A *final* draft of the dissertation must be reproduced and submitted to each member of the Dissertation Committee for review and evaluation twelve days before the dissertation evaluation forms are due at the Graduate School. The Final Oral Examination would then be conducted at least two working days after the evaluation forms are submitted to the Graduate School.

An electronic final copy of the dissertation, incorporating all corrections required by the Dissertation Committee, is required by the Graduate School. After the degree is conferred, the Graduate School will forward the dissertation as the copy of record to Deep Blue, the permanent digital repository of the University Library.

Perhaps the most frequent miscalculation made by doctoral candidates is *underestimation of the time required to write the dissertation*. Ordinarily, preparation of the dissertation will require a minimum of one full term after all of the research has been completed. Students are cautioned to be aware of the Graduate School deadlines for thesis submissions, which are early in the term in which the student wishes to graduate.

### **Final Oral Examination (Dissertation Defense)**

The Final Oral Examination is conducted by the Dissertation Committee after the Committee has reviewed the dissertation and submitted the evaluation forms to the Dean of the Graduate School. At the Examination, the Candidate gives an oral presentation of the research and defends the dissertation. The Final Oral Examination is advertised by the Graduate School and the Department and is open to any member of the University faculty or student body, with permission of the Dissertation Committee Chair. Following successful completion of the Examination, the Dissertation Committee recommends that the Graduate School award the Ph.D. degree.

### **Publication and Dissemination of the Thesis**

In addition to publishing the dissertation and making it available through Deep Blue, the Department expects that technical articles based on the dissertation research will be published in technical, peer reviewed journals, and that the work will be presented at professional meetings or conferences.

### **Registration**

The Graduate School requires that the student fulfill minimum registration requirements (See the BULLETIN or the Graduate Student Handbook).

### **Time Limits**

The target time for completion of all doctoral work from the time of matriculation is five years for students who joined the Program after the baccalaureate degree, and four years for those who matriculated with a Master's degree. The Graduate School sets the following maximum length of completion: Students must complete all doctoral work within five years of achieving candidacy, but no more than seven years from the date of the first enrollment in their Rackham doctoral program. The student exceeding this time limit must petition the Dean of the Graduate School through the Department for an extension of time and may be required to take additional examinations and/or course work.

### **Annual Evaluation**

An annual evaluation report must be completed, preferably before the end of the Winter semester, by all CEE PhD students regardless of how long they have been part of the Program. The advisor or the Graduate Committee may request more frequent submissions.

This report serves several purposes. Most importantly, it is used by the students and their advisors to formally review progress toward completing the Ph.D. degree. Students are encouraged to work closely with their advisors when drafting the report. The report must be submitted electronically to the CEE Graduate Program Office and will be maintained by the CEE Department as part of the student's academic record.

This report focuses on progress leading to successful completion and defense of the dissertation. There are other aspects of professional development (GSI and GSRA employment, off-campus employment, consulting, community service, etc.) that are also very important. Students are encouraged to update their curricula vitae (CV) and personal web page on a regular basis, and submit the most current version of their CV as an appendix to the report.

Information in the progress reports and the submitted CVs will be used by the advisors, the Graduate Program Committee, and the CEE faculty for several purposes, including: monitoring research progress, advising, assessment of eligibility and qualifications for honors and awards, and evaluation of progress for continued financial support.