

# INTERDEPARTMENTAL DOCTORAL PROGRAM IN TRANSPORTATION

February 2, 2017

The interdepartmental doctoral program in transportation provides a structured and direct follow-on doctoral program for students enrolled in the MST program or other transportation-related master's degree programs at MIT or elsewhere. The interdepartmental structure of the program allows students greater flexibility in developing individual programs of study that cross both disciplinary and departmental lines. The Transportation Education Committee (TEC) is responsible for admissions, establishment and oversight of program requirements, and conduct of the general examination and dissertation defense.

Graduates of the Interdepartmental Doctoral Program will receive a Ph.D. degree in Transportation, although students may petition for other MIT graduate fields of study as their degree designation, subject to faculty approval.

## 1. APPLICATION PROCEDURE

**For students already at MIT in a research-based program (MST, but others also qualify):**

Interested students should apply to the Doctoral Program by submitting an [internal application](#) for admission to the TEC. This application to the Interdepartmental Doctoral Program must include:

1. A one-page statement of the student's education, research and career objectives;
2. A proposed Program of Study consisting of subjects totaling at least 120 units (this may include courses taken to satisfy the MST or SM requirements);
3. Two letters of recommendation from MIT faculty familiar with the student, with at least one recommendation coming from a faculty member who can evaluate the student's research ability and potential.

Applications are reviewed at the end of the semester in which the application was received. Admission to the Interdepartmental Doctoral Program constitutes approval of the student's proposed Program of Study and allows the student to proceed with the General Examination.

The admission decision is based on the academic and research performance of the student to date, his/her potential to succeed in the doctoral program, and the suitability of the Program of Study. Prospective doctoral students currently registered in an MIT master's degree program are expected to submit an application for review before the end of their *second semester of graduate study*, with a deadline of May 15.

### **For applicants not enrolled at MIT:**

Students from other schools must submit a formal application for graduate study at MIT through the Department of Civil and Environmental Engineering (which administers the program), and are admitted as *graduate students* with the intention of entering the Interdepartmental Doctoral Program. They must also submit an internal application to the TEC at the end of their second semester of graduate study in transportation at MIT as described above.

Once admitted to the Interdepartmental Doctoral Program, students are called *doctoral students* preparing for the General Examination. Only after passing the General Examination students are designated as *doctoral candidates*.

The transportation faculty expects that all doctoral students will complete their research master's degree, either at MIT or elsewhere.

## **2. DEGREE REQUIREMENTS**

The Interdepartmental Doctoral Program requires the completion of:

1. An approved *Program of Study*.
2. The successful completion of a *General Examination*, which consists of both written and oral components.
3. The submission and defense of a doctoral *dissertation*.

In addition, it is the expectation of the faculty that all doctoral students will serve as a teaching assistant for at least one semester.

### **2.1. Program of Study**

This consists of at least **120 units** of subjects, as follows:

The Doctoral Core Program: The doctoral core program consists of three subject areas selected by the student. There are five approved areas defined by the subjects listed below.

- Transportation Systems Analysis: 1.200 and 1.201
- Demand: 1.202 and 14.381
- Performance and Optimization: 1.203 and (15.093 or 15.058)
- Planning and Policy: 1.251 and 11.478
- Networks: 1.208 and 15.081
- Logistics: 1.260 and (15.764 or (15.871 + 15.872))

Each student must select three of these five areas. The three selected areas must include Transportation Systems Analysis and at least one of the Demand or Performance and Optimization areas listed above.

The Remainder: A set of subjects in transportation and related fields.

MIT graduate level subjects taken to fulfill the requirements of the MST degree may be included in the doctoral program. The remainder of the program may include, subject to approval by the transportation faculty, up to 24 units of graduate level subjects taken elsewhere. The proposed Program of Study is an important part of the student's application to the Doctoral Program and, once approved, represents a commitment on the part of the student to complete this program.

Advising and Space: Student should consult their *Academic Advisor* when preparing their Program of Study. Any proposed change to an approved program is subject to review and approval by the *Academic Advisor*. During the first year of graduate studies, students are assigned both an *Academic Advisor* and a *Research Supervisor*. The *Research Supervisor* will help the student at every education and research stage, will provide space (shared or otherwise) with her/his research group and all necessary conditions for carrying out the planned research, and will ensure that the work meets MIT standards. Ultimately, the *Research Supervisor* is responsible for certifying and signing the thesis. From the second year onwards, the *Research Supervisor* also takes the role of *Academic Advisor*.

## 2.2. General Exams

All doctoral students are expected to take the General Examination no later than the fourth semester of graduate study at MIT. The General Examination is conducted in January and May each year. Students are encouraged to take the exam in January but this is not a requirement. The written exam is administered first and the oral exam takes place approximately 1-4 weeks after the written exam.

The written exam is a take home, open book examination. The three separate questions correspond to the three areas of the doctoral core program, with every student required to be examined on the Transportation Systems Analysis (1.200/1.201) area on day 1 of the written exam. The subsequent two exam questions correspond to two of the remaining five doctoral core program areas above, with each student selecting the additional two areas on which he/she will be examined. One of the areas must be Demand and Economics or Performance and Optimization. The three separate questions are administered over a 3- or 4-day period. Students will receive each day's questions at 9 AM and are expected to return the answer for that day's question by 6 PM. A student may take the exam without taking for credit the corresponding subjects, and the student need not take these subjects if the exam is passed. Credit for subjects not

taken, however, will not be granted.

The student must submit a research paper of up to 7 pages at least 1 week prior to the *oral* exam date. In the oral part of the General Examination, the student presents that research to demonstrate the student's *potential* to complete original work at the doctoral level. The research presented could be based on the student's master thesis and does not need to be on the topic of the doctoral research. This presentation generally lasts about 30 minutes, followed by up to one hour of questions from the faculty members in attendance. Although questions usually focus on the student's oral presentation, faculty members may also ask specific questions related to the student's doctoral core program and the student's response on the written exam.

Normally students complete both the written and oral portions of the General Examination before being informed of the outcome. There are four possible outcomes of the General Examination:

1. Pass the General Examination with approval to proceed with dissertation research.
2. Fail the General Examination with a recommendation to retake the oral portion of the exam.
3. Fail the General Examination with a recommendation to retake the complete exam.
4. Fail the General Examination with a recommendation that the student *not* retake the exam.

Students who fail the general exam on their first attempt have the option to retake the exam a second time.

The faculty in attendance at the oral presentation will make decisions with respect to student performance in the General Examination.

After passing the General Examination (written and oral) students are designated as *doctoral candidates*. At this point, funded students will have their stipends increased to doctoral levels.

### 2.3. Dissertation Research and Defense Process

Upon passing the General Examination, the student forms a Doctoral Thesis Committee. The Doctoral Thesis Committee is composed of at least three MIT faculty or senior research staff, including a minimum of one member from the student's Department of Registration. The Committee Chair must be a member of TEC. Research staff and experts from outside MIT may serve as additional members of the committee.

Within one academic term after passing the General Examination, a Doctoral Research Proposal must be submitted and presented to the Doctoral Thesis Committee (i.e. by the end of 5<sup>th</sup> term). The objectives of the research should be prepared with guidance from the Research Supervisor. The Proposal should be a maximum of 15-pages of single-spaced, 12-point font. Figures are included in the page count, but references are not. The following sections must be included.

**Abstract** – A one-page (or less) summary of the topic, the objectives/hypotheses to be

achieved/tested, and the methods. The abstract should be written for a general scientific audience, i.e. a person unfamiliar with the topic should understand what is being proposed and why it is important.

**Introduction** – The goal of this section is to motivate the research. Convince the reader why the project is important. The following progression is recommended. Introduce the topic and explain the broader relevance, e.g. what is the practical or fundamental importance. Demonstrate familiarity with previous studies. Identify knowledge gaps and connect to the proposed research.

**Objectives and Hypotheses** – Clearly state the research question to be answered and/or hypotheses to be tested and support it by explaining the logic that led to it. Preliminary data may be used as support.

**Proposed Research** – Describe the methods in sufficient detail to give a clear picture of how each research question will be answered and/or how each hypothesis will be tested. Include a time-line to demonstrate that the proposed work is feasible within the duration of a PhD degree. Describe specific expected results.

At least 10 days prior to the Doctoral Research Proposal presentation to the committee, the student should deliver copies of the written proposal to the committee members with a final schedule of when and where the presentation will take place. The possible outcomes of this presentation are:

1. Accept as written
2. Accept with modification
3. Fail with encouragement to retake within 6 months - the committee must include a list of specific deficiencies
4. Fail with specific notes on deficiencies (Only if this is second attempt)

The Committee Chair records the outcome and any specific requirements for alteration of the Doctoral Research Proposal and communicates it to the student and the TEC ([tec@mit.edu](mailto:tec@mit.edu)).

After the approval of Doctoral Research Proposal, the student is expected to proceed with his/her research, including possible changes in direction as agreed with the committee. During the dissertation research, the doctoral candidate must meet with his/her doctoral committee at least once every semester and demonstrate that significant research progress is being made. Once the dissertation is written and judged by the candidate's doctoral committee to be ready for defense, a Doctoral Dissertation Defense must be scheduled, at which the candidate presents the dissertation and summarizes the major contributions of the work.

MIT has three degree-granting cycles per year: February, June and September. At the start of term and by the deadline stated in the academic calendar, the student should register to be on the appropriate degree list through the [student.mit.edu](http://student.mit.edu) portal. The date of a doctoral defense must be at a minimum two weeks prior to the Department of Registration thesis submission

deadline. A copy of the dissertation must be available for review by all members of the Committee and other interested faculty at least two weeks before the Doctoral Dissertation Defense. Similarly, two weeks prior to the defense date the student should communicate the date, time, location and thesis abstract to TEC (tec@mit.edu).

The Doctoral Defense must be attended by the candidate's Doctoral Committee. A decision with respect to the success of the candidate's defense and completion of the Doctoral Program is made by all faculty members in attendance at the Doctoral Defense.

#### **2.4. Research Requirement and 1.THG**

Research plays an integral role in the PhD degree, and this research is tracked academically through enrollment in 1.THG. Students are required to register for 1.THG every semester. The number of credit hours is determined in consultation with your Supervisor. Through enrollment in 1.THG, students are formally graded on research performance each semester, in accordance with MIT Faculty Rules and Regulations 2.62.3 <http://web.mit.edu/faculty/governance/rules/2.60.html>

Thesis and research units **do not** count toward the 120 units required to complete the PhD degree.