

**Ph.D. PROGRAMS
in
ENGINEERING
at
BOSTON UNIVERSITY
(Ph.D. Handbook)**

A Guide for Students and Faculty

2007/2008 Academic Year

**College of Engineering
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1 INTRODUCTION

This document presents an expanded description of the requirements for earning a Ph.D. in an engineering discipline at Boston University. It also outlines the administrative and operational details involved in completing these requirements. It is intended to serve as a reference guide for students and faculty in the College of Engineering. The degree of Doctor of Philosophy (Ph.D.) may be earned through programs of study and research in the following disciplines:

- | | |
|---------------------------|------------------------------|
| 1. Aerospace Engineering | 5. Engineering Science |
| 2. Biomedical Engineering | 6. Manufacturing Engineering |
| 3. Computer Engineering | 7. Mechanical Engineering |
| 4. Electrical Engineering | 8. Systems Engineering |

2 ADMINISTRATION OF THE Ph.D. PROGRAM

The Departmental Graduate Committees, and in particular the Chairpersons of these committees, are involved in most aspects of Ph.D. students' programs. These committees serve as admissions committees, administer the qualifying examinations in their respective special field areas, recommend petitions, and monitor the progress of each student toward completion of degree requirements. The Department Graduate Associate Chairs are also members of the College of Engineering Graduate Committee. The Associate Dean for Research and Graduate Programs serves on this Committee as an ex-officio (non-voting) member.

The College of Engineering Graduate Committee administers the qualifying examinations in Applied Mathematics and Engineering Science. The Committee also serves to recommend policy and regulations which impact College-wide graduate program issues.

Faculty and students are encouraged to contact the Graduate Associate Chair in their department or the Associate Dean for Research and Graduate Programs for assistance in matters relating to an Engineering Graduate Program. Please refer to the Directory in Section 16.

3 ADMISSION

Students may be admitted to the Ph.D. program with either a Bachelor's or a Master's degree, or its equivalent, in engineering or a closely related field. Individuals who enter the postbachelor's Ph.D. degree program may receive a Master of Science degree provided they complete all departmental requirements for that degree. Part-time study may be considered in some circumstances.

Students are encouraged to matriculate in September to avail themselves of financial aid, orientation programs, and annual course sequences. January matriculation is also possible. International students requesting financial aid for September must submit a completed application by December 15th. The deadline for U.S. citizens and permanent residents (domestic applicants) requesting financial aid is January 15th. The application deadline for admission without financial aid is April 1st for the fall semester. All applications for the semester beginning in January must be received by October 1st. Financial aid for January applicants is limited. Decisions for financial aid are made in conjunction with the admission application.

All applicants are required to submit results from the General Graduate Record Examination (GRE). Applications submitted without the application fee of \$70 are not considered.

4 ADVISOR AND STUDY PLAN

4.1 Advisor

All degree-seeking students must have an advisor in the department of their major field. New students will be assigned an advisor at registration. If one is not assigned by the time of registration or if the student wishes to change his/her advisor, the student should consult with the Department Graduate Associate Chair (see the Directory in Section 16). As soon as an advisor has been assigned or changed, it is up to the student to provide that individual's name to the Department Office.

4.2 Program of Study

A program of study must be approved by the student's advisor and submitted for further approval to the appropriate Departmental Graduate Committee no later than the end of the first semester. A copy of the plan should be submitted to the Department Office for the student's file. Failure to obtain approval of such a plan of study within this time frame will preclude registration in the subsequent semester.

4.3 Academic Standards

Grades of C+ or lower are interpreted as failures for Ph.D. degree programs. Students in the program who receive such grades in more than two semester courses (or more than a total of eight credit hours) will be withdrawn from the program. Students in the postbachelor's Ph.D. program who declare an M.S. degree may use coursework with grades of C or C+ to satisfy the M.S. degree requirements.

4.4 Auditing Courses

An auditor is a student who attends a class to acquire knowledge, but not to earn credits or a grade. Audited classes do not count towards degree requirements. An auditor may not change his or her status after the fifth week of classes. Auditors must attend classes regularly, do assigned reading, and participate in discussions, but they are excused from examinations.

Auditors are admitted to a course on a space-available basis subject to the rules of the School or College offering the course. Auditors are subject to the full tuition and fees of the course. Scholarships will not cover tuition for audited courses.

Ph.D. students who have completed all credit requirements as outlined in Sections 8.4 and 8.5 are entitled to officially audit one course each semester, excluding summer term, at no charge. Engineering graduate courses at the 900 level, language courses, physical education courses, studio courses, or courses with laboratories may not be audited. Students eligible to audit a course should confirm their eligibility with the department.

5 TUITION

2007 - 2008 Tuition and Fees

Tuition for part-time students is \$1,092 per credit plus a registration fee of \$40 per semester. Students registering for twelve credits or more each academic semester are obliged to pay the full-time tuition of \$34,930 per academic year plus fees.

George Sherman Union Fee

Full-time Graduate students - Charles River Campus **\$186 per academic year**

Health Fee

Full-time Graduate students - Charles River Campus **\$164 per academic year**

Engineering Graduate Student Fee

\$30 per academic year

Medical Insurance

\$1,412 per academic year

The medical insurance requirement. Students enrolled for 3/4 time or more and all international students must enroll in the University's medical insurance plan unless proof of other comparable health insurance is provided. If

a student has other coverage and fails to submit a Waiver to Student Accounting Services by the deadline, that student is still obligated to pay the medical insurance charge. The University cannot accept medical insurance waivers based on coverage by an insurance company outside the United States.

6 TUITION SCHOLARSHIPS

6.1 Graduate Research Assistantships

Graduate Research Assistants in good academic standing, who receive a qualifying stipend, \$8,750 per semester, to conduct research from a qualified grant providing the required indirect cost, are eligible to receive up to ten credits tuition for graduate courses *applicable toward their degree* during each semester they work as an RA. Partial stipends, of at least \$4,375 per semester, paid from a qualifying grant, will entitle a partially funded Research Assistant to two credits of tuition scholarship.

6.2 Graduate Teaching Fellowships

Graduate Teaching Fellows in good academic standing, who receive the full stipend rate of \$8,750 per semester during the academic year, are eligible to receive up to ten tuition credits during each semester during the academic year, for graduate courses *applicable toward their degree*. In addition, Graduate Teaching Fellows are eligible to receive up to four tuition credits for each semester taught during the academic year to be used the following summer for courses *applicable toward their degree*. A maximum of twenty-four credits may be used over a calendar year. For example, if a Graduate Teaching Fellow uses ten credits in the Fall semester and ten credits in the Spring semester, he or she is eligible for four credits the following summer. A Graduate Teaching Fellow who uses eight credits in the Fall semester and eight credits in the Spring semester, is eligible for eight credits the following summer. GTF's must register for the Graduate Teaching Seminar (ENG SC850) during their first semester.

6.3 Dean's Fellowships

Dean's Fellows receive full-time tuition scholarship for coursework applicable toward their degree during the academic year and must maintain a full-time course load of sixteen credits. Dean's Fellows will be paid a monthly stipend of \$2,187.50 during the academic year (eight payments, September through April) as long as they maintain good academic standing. The Dean's Fellowship is a one academic year, non-renewable scholarship.

6.4 Dean's Research Fellowships

Dean's Research Fellows receive a stipend of \$8000 per semester and are eligible to receive up to 20 credits of tuition scholarship for the academic year.

6.5 Additional Benefits and Restrictions

The scholarships listed above provide for individual enrollment in the Boston University Medical Plan, a cost of \$1,412 for the 2007/2008 academic year.

Only courses applicable toward the degree will be covered by any type of tuition scholarship. Courses not applicable toward the degree and courses for which the grade of "W" (withdrawn) or "AU" (audit) is received will not be covered by tuition scholarship. ***The tuition scholarship will be withdrawn in such cases and the student will be responsible for full payment of the tuition charges.*** No student may work as either a Research Assistant or Teaching Fellow during the academic year without pursuing coursework toward their degree.

For more information please contact the Manager of Financial Aid in the Graduate Programs Office, 48 Cummington Street, Second Floor.

7 SCHEDULE

Obtain an Advisor	By the end of first semester after matriculation.
Submit Study Plan	By the end of first semester after matriculation.
Register for classes	<u>Before</u> the start of the semester.
Apply for Certified Full-Time Status (if required)	<u>Before</u> the start of the semester.
Mathematics Qualifying Examination	Must be taken the first time it is offered after Ph.D. matriculation. If this attempt is unsuccessful, one additional attempt is permitted the second time the exam is offered.
Subject Qualifying Examination	See specific departmental requirements. If no specific departmental requirement then a student must take and pass by the end of the fifth semester.
Ph.D. Candidacy	Official candidacy is achieved after passing both qualifying examinations, no later than the end of the fifth semester. Both the postbachelor's and post-master's degree programs must be completed within five years of the student's acceptance into Ph.D. candidacy.
Meet with Major Advisor	Prior to each semester to discuss course of action for degree program. Set up a research project for prospectus.
Scheduling of Prospectus Defense	See section on Prospectus Defense. Within one year of becoming a candidate a student is expected to present a Prospectus Defense. No student will be allowed to present a Prospectus Defense who has not become a candidate in the Ph.D. Program.
Declare M.S. degree	Postbachelor's Ph.D. students should declare their M.S. degree. See section 8.4.
Diploma application	To be submitted to the Department Office by: November 1, 2007 for the January 2008 Graduation; February 1, 2008 for the May 2008 Graduation.
Dissertation Abstract	See section on Final Oral.
Last day to hold Final Oral Examination	January 4, 2008 for the January 2008 Graduation. April 11, 2008 for the May 2008 Graduation.
Approved and signed dissertation due in the Department Office	January 11, 2008 for the January 2008 Graduation. April 18, 2008 for the May 2008 Graduation.
Library Submission	See section on Library Submission.

8 REQUIREMENTS

8.1 Registration

All students are required to register each academic semester (Fall and Spring) unless on an approved Leave of Absence. A continuing student is required to register prior to the registration deadline or a late fee will be assessed. If a student needs to be registered for either of the summer terms, it is his/her responsibility to do so.

8.2 Leave of Absence or Withdrawal

Normally, students must register for each academic semester (excluding summer term) until the completion of all degree requirements. If a student requires a leave of absence, it is the student's responsibility to submit a completed "Withdrawal/Leave of Absence" form (see the list of forms in Section 15) to the Graduate Programs Office. Students are allowed a maximum of two semesters of leave without having to re-apply to the program. Beyond two semesters, the student must submit a petition approved by the advisor and the Department Graduate Associate Chair to the Graduate Programs Office. *The Leave of Absence/Withdrawal form must be submitted before the first week of classes, or the student is responsible for a certain percentage of the cost of his/her tuition, based on the exact day the form was submitted to the Graduate Programs Office.* Mere absence from classes does not reduce a student's financial obligation or guarantee that a final grade will not be recorded.

A student who withdraws from the University before classes start is eligible to receive full credit of tuition and fees excluding non-refundable deposits and the application fee. No fees are returned after classes start. A request for a withdrawal or leave of absence is effective on the day it is received in the appropriate office; charges are canceled based on the effective date in accordance with the University's published refund schedule available at www.bu.edu/reg. A credit balance (overpayment) resulting from withdrawal, cash payment, and/or other adjustment will be refunded by request in writing, or in person, at the Student Accounting Services, 881 Commonwealth Avenue, Boston, MA 02215.

The period of authorized leave of absence is counted as part of the time allowed for completion of degree requirements.

International students must also contact the International Students and Scholars Office when taking a leave of absence or when withdrawing from the University.

All students receiving financial aid or student loans should contact the Manager of Financial Aid, Graduate Programs Office, 48 Cummington Street, Second Floor, regarding their continued eligibility for those funds. ***Tuition scholarship will not cover the cost of courses from which a student withdraws.*** Federal funds will be disbursed on a pro-rated basis, depending upon the actual date of leave or withdrawal.

8.3 Full-Time Status

Normally, no more than four (4 credit) courses should be taken concurrently. Students such as RA's and GTF's generally register for eight credits each semester until completion of all credit requirements. The only exception is an authorized Leave of Absence. *All International students must be classified full-time to maintain their visa status.* Students who need to be certified full-time **must** complete a "Certificate of Full-Time Participation in Graduate Program" form (see the list of forms in Section 15). This form must be completed **each semester** at the time of registration. This form must have the appropriate eligibility box checked off with the signatures of the Advisor and the Department Graduate Associate Chair before it can be processed by the Graduate Programs Office.

8.4 Credit Requirement for Postbachelor's Ph.D. Students

Postbachelor's Ph.D. students are required to complete a minimum of 64 credits applicable to their degree. Of this total, 32 credits must be structured courses of which 28 credits must be at the 500 level or higher. A minimum of 16 research/dissertation credits is required. In addition, each Department has specific requirements as described in the Engineering Graduate Programs Bulletin. Students should consult their Department Graduate Associate Chair for further information.

Postbachelor's Ph.D. students admitted to the program beginning Fall 2005 are required to declare the M.S. degree upon fulfillment of the degree requirements. Students enrolled in Systems Engineering or in the dual M.D./Ph.D. program are exempt from this requirement. A completed prospectus may be used to satisfy an M.S. project or thesis requirement.

It is strongly recommended that students admitted to the postbachelor's Ph.D. program prior to Fall 2005 also declare the M.S. degree upon completion of the degree requirements.

8.5 Credit Requirement for Post-Master's Ph.D. Students

There are no structured course requirements for post-master's Ph.D. students; however, students are required to complete 32 credits applicable to their degree. Of those, a minimum of eight credits of research/dissertation are required. Students should consult with their Department Graduate Associate Chair to determine specific departmental requirements. Post-master's Ph.D. students, who have completed all credit requirements, are required to register for a minimum of two research or dissertation credits each academic semester unless taking a specific course or on an approved Leave of Absence. *Courses below the 500 level are not applicable to the post-master's Ph.D. program.* Post-master's Ph.D. students are not permitted to declare an M.S. degree. Questions concerning this policy should be directed to the department graduate administrator.

No courses may be transferred from other universities to reduce the 32 credit requirement. Specific requirements relative to the selection of courses, seminars, and research or directed study will be determined in consultation with the student's advisor.

Post-master's Ph.D. students who obtained their Engineering Master of Science degree at Boston University may petition to apply credits not used for their Master of Science degree to their Ph.D. program. Only credits that are applicable to degree requirements are acceptable (i.e., 500 level and above, a B or better, etc.). The student is required to fill out a petition form and have it signed by his/her advisor and Department Graduate Associate Chair before submitting it to the Graduate Programs Office for processing.

8.6 Residency Requirement

Each student must satisfy the minimum residency requirement of two consecutive regular semesters of full-time graduate study at Boston University. Full-time study in this context is a full-time commitment to the completion of degree requirements as determined by the Associate Dean for Research and Graduate Programs. **In order to graduate**, students must be registered as full or part-time students in the semester in which they complete degree requirements and in the preceding semester.

9 QUALIFYING EXAMINATIONS

9.1 General Information

Students must pass two written comprehensive examinations covering basic knowledge in:

1. applied mathematics
2. one area of specialized study (the special field or subject exam)

The student's area of concentration determines the specific nature and scope of the subject examination. The subject matter of the examinations is typically covered in advanced undergraduate courses, although the questions require an understanding and insight beyond the coursework normally achieved by undergraduates. Each department coordinates the administration of the subject exam. The College of Engineering Graduate Committee administers both the Mathematics Qualifying Examination and the Engineering Science Examination. Both qualifying examinations are limited to two attempts. Departments may limit attempts of the subject examination to one if they so choose. Students who do not pass either one or both qualifying exams are withdrawn from the Ph.D. program.

All Ph.D. students must take the Mathematics Qualifying Examination the first time it is offered after Ph.D. matriculation. Students will be given one additional attempt if the first is unsuccessful. This additional attempt

must be the second time the exam is offered after Ph.D. matriculation. Students who fail to appear for the exam as required receive a failing grade.

All Ph.D. students are required to pass the Subject Qualifying Examination no later than the end of their fifth academic semester unless required to do so earlier by their department.

For specific departmental requirements concerning both exams, see Sections 9.3 through 9.9.

9.2 Qualifying Exam Requirements for Transfer Ph.D. Students

Transfer students must provide ample evidence they have satisfactorily passed comparable examinations to the College of Engineering's Mathematics Qualifying Examination and the Departmental Qualifying Examination.

A student interested in waiving a qualifying examination requirement should submit a petition (see the list of forms in Section 15) for review by the College of Engineering Graduate Committee. The petition must be approved by the advisor and the Department Graduate Associate Chair. Copies of qualifying examination(s) taken at the previous institution must be attached. The petition is then submitted to the Director of Graduate Programs, 48 Cummington Street, Second Floor, to be placed on the agenda for the next Engineering Graduate Committee meeting. For the subject examination, the Graduate Committee will require a recommendation for a waiver from the student's department. The Mathematics Subcommittee will be asked for their recommendation if a petition involves the mathematics examination.

9.3 Mathematics Qualifying Examination

9.3.1 The student must select questions from four of the following areas at the time of the examination:

(1) ordinary differential equations; (2) Fourier series and Fourier transforms; (3) linear algebra; (4) vector analysis; (5) partial differential equations; (6) complex variables; (7) probability and statistics; (8) discrete mathematics; (9) algorithms. Before preparing for the exam, students should verify with their Department Graduate Associate Chair that this list of topics has not changed.

This examination is offered in January and April/May of each year by the College Faculty under the direction of the College Graduate Committee. Calculators are not permitted at the exam. Copies of previous examinations may be obtained from the Graduate Programs Office, 48 Cummington Street, Second Floor. Copies of the examinations are also on reserve in the Science & Engineering Library, 38 Cummington Street.

The next offerings of the Mathematics Qualifying Examination are at 9:00 A.M. on Saturday, January 12, 2008 and on Saturday, May 3, 2008.

9.3.2 A Leave of Absence will not exempt an individual from completing the Mathematics Qualifying Examination within the required time frame.

9.3.3 The Mathematics Qualifying Examination is normally taken by admitted Engineering Ph.D. students, but it may also be taken by currently enrolled Master of Science students. Master of Science students who have not yet completed their degree requirements may petition for department approval to take the Ph.D. Mathematics Qualifying Examination *once* with the following results:

- (a) A pass will satisfy the Ph.D. Mathematics Qualifying Examination requirement.
- (b) A failure will count as one of the two attempts to which a Ph.D. student is entitled.

Students must be registered as either a College of Engineering Master of Science or Ph.D. student to participate in the Mathematics Qualifying Examination. To take the January examination, the student must have been enrolled in the previous Fall semester. To take the May examination, the student must be enrolled in the Spring semester.

9.3.4 For students who fail the exam, the student's Department will determine which of the following options apply. After first failed attempt:

- (a) The student may be asked to retake the entire exam.

- (b) The student may be asked to retake selected portions of the exam. One hour per topic is allowed.
- (c) The student may be asked to choose additional areas of the exam to take again. One hour per topic is allowed and the topics are chosen at exam time.
- (d) The student may be asked to take one to four specific math courses to make up for deficient areas.

After second failed attempt:

- (a) The student may be asked to take one to four specific math courses to make up for deficient areas.
- (b) The student may be removed from the Ph.D. program by the department.

Students must receive a grade of “B+” or better for remedial coursework. No one course can be used to satisfy a deficiency in more than two sections of the exam.

Students who fail the exam twice and are withdrawn from the Ph.D. program are not permitted to re-apply for a period of two years.

9.3.5 Students who wish to appeal the results of the exam may request copies of their exam papers and grades from the chair of the math exam committee. A petition must be submitted to the Engineering Graduate Committee within thirty (30) days after the notification of results. The student must complete a "College of Engineering Petition" form (see list of forms in Section 15) and obtain signatures from his/her advisor and Department Graduate Associate Chair. The petition form is then submitted to the Director of Graduate Programs, 48 Cummington Street, Second Floor, to be placed on the agenda for the next Engineering Graduate Committee meeting. If the Committee decides to proceed with the petition, the original math exam graders will be asked to re-examine the exam papers to determine if errors or misinterpretations occurred in the grading process. In order to maintain fairness and consistency for all students who take the exam, the original grading system (penalties for specific mistakes, relative weights of individual problems, etc.) is *not* subject to petition. The student will receive written notification of the Engineering Graduate Committee’s decision.

9.4 Subject Qualifying Examinations

9.4.1 All students must pass one of the following subject examinations in the department of his/her major field:

- (a) Aerospace and Mechanical Engineering
- (b) Biomedical Engineering
- (c) Electrical and Computer Engineering
- (d) Manufacturing Engineering
- (e) Systems Engineering
- (f) Engineering Science

Next offering of subject exams:

Aerospace/Mechanical	April 2008
Biomedical	June 2008
Electrical/Computer	April 5, 2008
Manufacturing	January 11, 2008, May 27, 2008
Systems	same as home department

9.4.2 Rules Governing the Subject Examinations

DEPARTMENT	POSTBACHELOR’S Ph.D.	POST-MASTER’S Ph.D.
Aerospace/Mechanical	Must pass within the first two times the exam is offered.	Must pass within the first two times the exam is offered.
Biomedical	Must pass oral qualifier at end of first academic year.	Must pass oral qualifier at end of first academic year.

<u>DEPARTMENT</u>	<u>POSTBACHELOR'S Ph.D.</u>	<u>POST-MASTER'S Ph.D.</u>
Electrical/Computer	Must pass within four semesters. Those matriculating in January must pass within five semesters.	Must pass within four semesters. Those matriculating in January must pass within five semesters.
Manufacturing	Must pass within three semesters and attempt on the first offering after passing the math exam.	Must pass within three semesters and attempt on the first offering after passing the math exam.
Systems	Same as home department.	Same as home department.

9.4.3 A leave of absence will not exempt an individual from completing the Subject Qualifying Examination within the required time frame.

9.4.4 Subject examinations are generally administered by Departmental Graduate Committees. The Systems examination is administered by the home department's Graduate Committee in coordination with the interdepartmental Systems Engineering Ph.D. Committee. The Engineering Science examination is administered by the Engineering Graduate Committee. Information regarding content and scheduling should be directed to the Chairpersons of the Department Committees (see the Directory in Section 16).

Copies of previous subject examinations may be obtained from the Department Office. Copies are also on reserve at the Science & Engineering Library at 38 Cummington Street.

9.4.5 The Subject Qualifying Examination is normally taken by admitted Ph.D. students; but, it may be taken by a currently enrolled Master of Science student upon the recommendation of the student's Department Graduate Committee.

Any person not registered as either a College of Engineering Master of Science or Ph.D. student **will not be allowed to participate** in the Subject Qualifying Examination.

9.4.6 **Two failures of the subject examination result in withdrawal from the program**, with the exception that departments may limit the exam to one attempt. If a student fails the examination for a second time, the student does have the right to petition the outcome of that exam. A petition **MUST** be completed within thirty (30) days after the notification of failure. The student must fill out a "College of Engineering Petition" form, obtain his/her advisor's signature, and submit it to the Department Graduate Associate Chair for the department's recommendation. The petition form is then submitted to the Director of Graduate Programs, 48 Cummington Street, Second Floor, to be placed on the agenda for the next Engineering Graduate Committee meeting. The student will receive written notification of the Engineering Graduate Committee's decision.

9.5 Aerospace and Mechanical Subject Qualifying Examination

The Aerospace and Mechanical Engineering Ph.D. Qualifying Exam is held once a year in April. It consists of written and oral components.

All AME doctoral students must pass the examination within the first two times that it is offered after their matriculation. If the student chooses not to take the exam the first time it is offered, the student will only have one opportunity to take the exam (i.e., during the second offering). Students who fail the exam in the first offering must retake the entire exam. Failing the exam twice results in withdrawal from the Ph.D. program.

Students must register for the exam in advance by completing an application form (available on the AME webpage) and submitting it to the AME Graduate Coordinator. The application deadline is in early March.

9.6 Biomedical Subject Qualifying Examination

The BME Qualifying Examination is an oral qualifying examination. The emphasis of the exam is on integration of basic knowledge gained in the core courses, and, relating that knowledge to the student's chosen research interests.

Please refer to the Department of Biomedical Ph.D. Guidelines handout for specific exam, registration deadlines and format information and contact the department office to register for the exam.

For students receiving conditional passes, conditions for qualification are determined by the BME Graduate Committee. Students who fail the exam are not allowed to re-take it and are withdrawn from the program. Such students can request to remain in the program only by formal petition to the BME Graduate Committee within 30 days of receiving exam results.

9.7 Electrical and Computer Subject Qualifying Examination

The Electrical and Computer Engineering examination is offered once a year. The 2007/2008 examination will be held on Saturday, April 5, 2008. Copies of previous exams are available online, under the Student Tools section of the ECE website.

Ph.D. students have four semesters to pass the exam (five semesters for those matriculating in January). Master of Science students who will be continuing on to the Ph.D. program are encouraged to attempt the exam during the last semester of their Master's degree studies.

The exam is graded on a pass/fail basis. Students have two opportunities to pass the exam within the allowed time frames. The examination is closed book and based on advanced undergraduate and introductory master's level material. Questions are written to stress mastery of major concepts and problem solving ability.

9.8 Manufacturing Subject Qualifying Examination

Ph.D. students are required to take the subject examination in their area of research. These areas are Manufacturing Systems and Operation Research, Engineered Materials and Processes, Computer-Integrated Design, Analysis and Manufacture, Automation and Control in Manufacturing, Microelectronic Fabrication, and MEMS. Information about the coverage of the exam is available from the Department's Graduate Coordinator.

The exam consists of two parts, written and oral. The pass/fail decision will be based on the student's performance in both parts. Depending on the performance, students will be placed in one of the three following categories: Pass, Re-take, or, Fail. Students in the Re-take category will get one more chance to pass the exam the next time it is offered. Students who fail the exam will be withdrawn from the Ph.D. program. Such students can request to re-take the exam through a petition endorsed by the research advisor to the Manufacturing Graduate Committee within 30 days of receiving exam results. The Manufacturing Graduate Committee will evaluate the petition in consultation with the Area Exam Committee.

9.9 Systems Subject Qualifying Examination

Students pursuing the interdepartmental Ph.D. in Systems Engineering are required to take the subject examination in their Systems Engineering area of research as specified by their home department's Graduate Committee Chairperson. Rules governing the Systems Engineering subject examination are those of the student's home department as presented in section 9.4.2.

The interdepartmental Systems Engineering Ph.D. Committee, chaired by Professor Pirooz Vakili, sets the requirements and administers the subject qualifying examination for Systems Engineering Ph.D. candidates in coordination with the student's home department graduate committee. The Systems Engineering subject examination is offered at least once every year. Information regarding the examination's content and scheduling should be obtained from the student's home department Graduate Committee Chairperson.

10 Ph.D. CANDIDACY

A student is admitted to Ph.D. candidacy upon successful completion of both qualifying examinations. At that time the candidate will receive formal notification of Ph.D. candidacy from his/her Department Office. Students should take the initiative by checking with his/her department if they do not receive a candidacy letter within a reasonable time after passing the second qualifying examination.

The maximum period allowed between matriculation and acceptance to Ph.D. candidacy is usually five semesters, but departments can specify a lesser time frame based on qualifying examination results. The period of an authorized leave of absence is counted as part of the time allowed for completion of degree requirements.

Students are expected to present their Prospectus Defense within one year of candidacy.

In no instance will a student be allowed to present a Prospectus Defense until he/she has become a Ph.D. candidate.

Ph.D. students enroll for research credits until they pass their Prospectus Defense. After that time, they are eligible to enroll for either dissertation or research credit.

Once entered, Ph.D. candidacy will expire on its fifth anniversary. The student may need to petition the Engineering Graduate Committee for an extension of time. The "College of Engineering Petition" form (see the list of forms in Section 15), with appropriate signatures should be submitted to the Director of Graduate Programs, 48 Cummington Street, Second Floor. The petition will be reviewed by the Engineering Graduate Committee and the student will be advised in writing of the outcome. **No student will be allowed to defend a completed Ph.D. dissertation if he/she is not a Ph.D. candidate.**

11 DISSERTATION PROSPECTUS DEFENSE

11.1 Overview

Within one year of attaining candidacy, it is expected that a Ph.D. candidate will present an Oral Dissertation Proposal to the prospective dissertation committee and obtain approval for the dissertation. In the ECE Department, students must complete the prospectus requirement within two years of attaining candidacy. A complete package of information and necessary forms can be obtained from the Department Office. In no instance will a student be allowed to present a Prospectus Defense until he/she has become an "official" Ph.D. candidate. Ph.D. students should check with their department office for any additional rules or restrictions.

11.2 Dissertation Topic

A research problem is selected after initial discussions between a faculty Research Advisor and the student. The student registers for research credits until sufficient investigation of the topic has been undertaken to believe the subject is worthy of a dissertation, and at that time a Dissertation Committee is formed.

11.3 Prospectus Defense Committee

The Prospectus Defense Committee will normally consist of a minimum of three College of Engineering tenured or tenure-earning faculty and must include at least two faculty members of the academic department in which the student is enrolled. Membership of the committee generally constitutes the nucleus of the Final Oral Examination Committee.

The composition of the Prospectus Defense Committee is to be reported to the Department Graduate Associate Chair by the Research Advisor prior to scheduling the Prospectus Defense. The Chairman of the Committee is the student's Research Advisor. A major doctoral Research Advisor who is not a member of the doctoral student's department may serve under the following two conditions:

- a. He/she is approved by the department's Graduate Committee.
- b. A faculty member of the doctoral student's department accepts to serve as co-major Research Advisor.

Occasionally scholars from outside the University serve on dissertation committees. When a scholar is from outside the University a "Special Service Appointment" form (see the list of forms in Section 15) must be completed. A copy of the person's vitae and the completed form, with the Department Graduate Associate Chair's approval is submitted to the Associate Dean for Research and Graduate Programs. The student will be notified in writing of the approval or disapproval of the person requesting special appointment.

11.4 Dissertation Prospectus

The student must provide a copy of the Dissertation Prospectus to all members of the Prospectus Defense Committee. The proposal should include:

- **a statement of the problem to be investigated**
- **its background and significance**
- **approach(es) to be followed for its resolution**
- **preliminary results**
- **anticipated timetable for completion**
- **pertinent bibliography**

The proposal should specifically document the anticipated contribution that this work will have to the body of knowledge. A separate page listing the proposed title, author's name, Research Advisor's name and an abstract of no more than 350 words must also be submitted.

The preferred format is similar to that of proposals submitted to a Federal Agency. There is a 25 page (single space) limit on the scientific portion of the proposal. This includes tables and figures but does not include the bibliography. Please refer to the "Guide For the Writers of Theses and Dissertations" (see list of forms in Section 15).

After reading the Dissertation Prospectus and agreeing that the student is ready, the Prospectus Committee members will indicate their approval on the "Ph.D. Dissertation Prospectus Defense" form (see list of forms in Section 15). It is the student's responsibility to obtain the necessary committee members' signatures and an agreed upon date and time for the presentation. The student is responsible for reserving a room for the presentation. When all this has been completed and noted on the "Dissertation Prospectus Defense" form, the form (with abstract attached) is submitted to the Department Graduate Associate Chair for approval. The Department Graduate Associate Chair must indicate approval on the form, send a copy of the form and the abstract to the Department Office and then forward the original form to the Chair of the Prospectus Committee. It is the Chair's responsibility to bring the original form containing the Committee Members' signatures to the oral presentation.

11.5 Oral Presentation of the Prospectus

A public oral presentation of the Prospectus must be held to describe the research and demonstrate the student's preparation. The schedule of the oral presentation is distributed by the department once the student is advised by the Committee that the proposal is accepted for the oral defense.

The oral defense will be scheduled no earlier than two weeks after the written Prospectus is accepted by the committee. The title, abstract, date, time and location of the Oral Proposal Defense must be submitted to the Department Graduate Associate Chair, with a copy to the Department Office, two weeks before the Prospectus Defense. Necessary form(s) and description of defense procedures are available in the Department Office.

It is the Department's responsibility to provide adequate publicity for the student's Prospectus Defense.

The faculty Research Advisor should chair the Defense and begin with an introduction of the Ph.D. student. The introduction should include a brief description of the student's academic background. The student should restrict the length of the presentation to approximately one hour. During this period, questions may be asked by Committee Members or the audience. The Chair should guard against digressions and inappropriate questioning during the presentation. Following a reasonable question period, the student and the audience are dismissed and the Committee remains to complete its assessment of the Prospectus Defense.

11.6 Assessment of the Prospectus Defense

The Dissertation Prospectus Committee is charged with assessing the appropriateness of the problem and the student's preparation based on the written dissertation proposal and the oral presentation. The Committee must decide if the student passes, passes with conditions, or fails. The Committee may determine that the student needs additional courses and/or suggest revisions to the dissertation topic goals and approaches to the solution. If there are required revisions to the written proposal, or if additional course work is required, such conditions must be appropriately documented and attached to the Ph.D. Prospectus Defense Form.

11.7 Reporting of the Prospectus Defense

The Chair of the Committee will complete the "Prospectus Defense Results" section on the "Ph.D. Dissertation Prospectus Defense" form (see list of forms in Section 15). If the student is required to meet certain conditions, those conditions should be listed on a separate sheet and attached to the form. Those conditions should also contain time frames for completion. The Chair then signs the form and forwards it to the Department Graduate Associate Chair for signature.

After the Department Graduate Associate Chair records the results of the defense, the signed original "Ph.D. Dissertation Prospectus Defense" form is forwarded to the Department Office. The department will confirm the results of the Prospectus Defense to the candidate in writing. If the results indicate that more work must be done and/or that specific conditions must be met, these conditions will be indicated in the letter to the student.

11.8 Registration after Passing Prospectus Defense

If they have not yet met the requirement of 64 credits as outlined in Section 8.4, postbachelor's Ph.D. candidates must enroll for a **minimum** of eight credits of dissertation each semester until the requirement is met. If post-master's Ph.D. students have not yet met their 32 credit requirement as outlined in Section 8.5, they must enroll for a minimum of eight credits of either dissertation or research credits each semester until they have met the requirement. Once all credit requirements have been satisfied, Ph.D. candidates must enroll for a minimum of two dissertation/research credits per semester until completion. Registration each semester allows the student to use all academic facilities of the University and entitles Ph.D. candidates to audit one course per semester, excluding summer term, at no charge. Students may not audit 900-level courses, language, physical education, studio courses or courses with laboratories. **Failure to register for two consecutive academic semesters without having been granted an authorized Leave of Absence will result in termination of degree status.**

12 FINAL ORAL REQUIREMENTS

Ph.D. candidates are expected to prepare and carry out an independent and original research project in their field of study in partial fulfillment of the Ph.D. requirement. The dissertation will be primarily guided by the Dissertation Advisor, with the advice of the remaining members of the Dissertation Committee. Students shall present themselves for a Final Oral Examination in which they must defend their dissertation as a worthy contribution to knowledge in their field and demonstrate mastery of their field of specialization as related to the dissertation.

Students are expected to read and follow the latest edition of the "Research Guide for the Writers of Theses and Dissertations" (see the list of forms in Section 15). Although students will have an opportunity to make final revisions to the dissertation and abstract after their Final Oral Examination, they should not regard their Final Oral Examination version as a "rough draft." Specifically, this version of the abstract is the version circulated to the College of Engineering, members of the examining committee and the Office of the Provost and Executive Vice President. A final version of the abstract is submitted with the definitive version of the dissertation for publication in *Dissertation Abstracts International*.

No student will be allowed to defend a completed Ph.D. dissertation if he/she is not a Ph.D. candidate. These are the minimum requirements of the College of Engineering. Ph.D. students should check with their Department Office for any additional rules or restrictions.

12.1 Final Oral Defense Committee

The nucleus of the Final Oral Examination Committee is normally comprised of the Prospectus Defense Committee. **The minimum Final Oral Committee size is five:** two of the five members on the committee must be (tenured or tenure earning) faculty from the student's academic department; the student's major advisor serves as the first reader; and, the Chair for the committee is assigned by the department. A reader cannot also act as the Chair for the committee. The Chair does not have to be a member of the student's academic department, but must be a member of the College of Engineering. A major doctoral Research Advisor who is not a member of the doctoral student's department may serve under the following two conditions:

- a. He/she is approved by the department's Graduate Committee.

- b. A faculty member of the doctoral student's department accepts to serve as co-major Research Advisor.

When a scholar is from outside the University a "Special Service Appointment" form (see the list of forms in Section 15) must be completed. The completed form and a copy of the person's vitae, with the Department Graduate Associate Chair's approval is submitted to the Associate Dean for Research and Graduate Programs. The student will be notified in writing of the approval or disapproval of the person requesting special appointment. If this process was followed during the Prospectus Defense, the information should already be in the student's file and will not need to be repeated. However, if this is a new member or for some reason the process was not followed at the time of the Prospectus Defense, it will need to be done prior to scheduling a date for the final defense. This is a College rule that will serve as a minimum requirement. Departments may adopt additional rules or prohibit outside major advisors.

12.2 Ph.D. Dissertation Defense Abstract

The candidate submits the abstract, maximum of 350 words, along with a "Ph.D. Dissertation Defense Abstract" form (see the list of forms in Section 15) to his/her major professor for approval and signature. Once the abstract has been approved by the major professor, signed, and a tentative defense date determined, the student is responsible for bringing the signed form along with a copy of the abstract to the Department Office. **This must be at least three weeks prior to the proposed date of the dissertation defense.**

The abstract is reviewed by the Associate Dean for Research and Graduate Programs. The Department Office notifies the candidate in writing if it is acceptable or needs revisions. Once a final abstract has been approved, it is the responsibility of the student to send an electronic (e-mail) version of the abstract to the Department Office for announcement purposes.

12.3 Final Oral Examination

The Final Oral is a public presentation of the candidate's dissertation. The presentation should clearly define the problem, describe the method(s) used to solve the problem, report results and establish significance of the results. The candidate should contact the Department Office for **current** forms, guidelines and deadlines.

The purpose of the Final Oral Examination is to ensure that the dissertation constitutes a worthy contribution to knowledge in the candidate's field and that the candidate has attained mastery in his/her field of research specialization.

12.4 Arranging for a Final Oral Examination

In preparation for the Final Oral Defense, it is the candidate's responsibility, in conjunction with his/her Research Advisor, to appoint a Defense Committee. The Committee consists of those tenured or tenure-earning faculty who participated in the Prospectus Defense and others to make a minimum of four readers. A minimum of two members must be tenured or tenure earning faculty in the student's department. The chair, who cannot be a reader, for the Final Oral Examination is assigned by the department for a minimum total of five members. The Chair does not have to be a member of the student's academic department, but must be a member of the College of Engineering. If any Committee member is not a member of the Boston University faculty a "Request for Special Service Appointment in Engineering" form (see the list of forms in Section 15) must be submitted with his/her curriculum vitae to the Associate Dean for Research and Graduate Programs.

The candidate must provide a copy of the Dissertation to all members of the Final Oral Examination Committee prior to requesting that his/her examination be scheduled. The student can obtain a copy of "Guide for the Writers of Theses and Dissertations" (see the list of forms in Section 15), from the Department Office. It is the candidate's responsibility to ensure that all formatting and reproduction requirements are met, including his/her Abstract and Dissertation.

The student is responsible for obtaining a preferred date and time for the presentation by having the agreement of all his/her Committee members.

It is the candidate's responsibility to obtain signatures of all Committee members on the "Ph.D. Final Oral Examination" form indicating they have read the dissertation and agree the individual is prepared to proceed. It is

suggested that the candidate practice his/her presentation with his/her advisor prior to the actual presentation. The candidate obtains the Department Graduate Associate Chair's signature indicating approval of the Committee and scheduled Defense date. The candidate then submits the form to the Department Office. **This must be done, at a minimum, two weeks prior to the defense.** Candidates must adhere to the current deadlines for completing the Final Oral Examination and submitting their Dissertation (see the list of deadlines in Section 14).

Room arrangements are made by the Department Office. The name of the Chairperson, who cannot also be a reader, is provided to the candidate by the department. It is the student's responsibility to arrange a meeting with the Chair prior to his/her presentation. The student is also responsible for providing the Chair with a copy of the dissertation.

It is the department's responsibility to provide adequate publicity for the student's Final Oral Defense a minimum of two weeks prior to the Dissertation Defense.

The signed original "Ph.D. Final Oral Examination" form is sent to the Chair by the Department Office. The Chairman brings the original form to the presentation.

12.5 Conduct of the Final Oral Examination

No Final Oral Examination may begin unless all College approved committee members, as listed on the "Final Oral Examination," form are present. It is the Chairman's responsibility to enforce this requirement. The faculty Research Advisor or Committee Chair should introduce the candidate and include a brief academic background description.

The candidate should restrict the length of the presentation to approximately one hour. The candidate's conduct should be of a professional manner, and any handouts, slides etc., should be neatly prepared. During this period, questions of clarification may be asked by the Committee members or the audience.

The Chair should guard against digression and inappropriate questioning during the presentation. It is the Chair's responsibility to ensure the student's presentation is given the respect it deserves by not allowing Committee or audience members to have side discussions.

Following a reasonable question and answer period, the audience should be dismissed by the Chair. The Committee may wish to ask additional questions of the candidate at this time. Following this additional questioning by the Committee, the candidate should be excused so the Committee may complete its assessment of the Defense and Dissertation.

12.6 Assessment of the Final Oral Examination

The Final Oral Examination Committee is charged with assessing the completeness of the research, contribution to knowledge, and the candidate's mastery of his/her research area, based on the written dissertation and the oral presentation. Vote may be ballot or voice. A unanimous vote is required for a candidate to pass.

It is the Chairman's responsibility to call the candidate back after the Committee has reached a decision. The Chairman will advise the student of the Committee's decision. At this time the candidate should be advised of any changes that must be made to the final title, abstract or dissertation document.

12.7 Reporting the Results of the Final Oral Examination

The College's "Ph.D. Final Oral Examination Form" must be completed at the examination, with specific indication of whether the title, abstract and dissertation are acceptable as submitted. It is the Chair's responsibility to see that this form is completed and signed. Any required revisions are to be noted on the form and a separate piece of paper indicating what is to be done is then attached to the form. Time frames should be included in the listing. Committee members should sign off on the "Ph.D. Final Oral Examination" form at this time, **but will refrain from signing the Approval page until all conditions have been met.** If all requirements are acceptable, the Approval page (see the list of forms in Section 15) of the dissertation is to be signed by all Committee members, except the Chair.

The Chair delivers the signed "Ph.D. Final Oral Examination" form and any attachments to the Department Graduate Associate Chair. The Department Graduate Associate Chair records the results and sends the signed document to the Department Office. It is the responsibility of the Department Office to ensure that all necessary information is recorded with the University.

12.8 Dissertation Approval

Final approval of the title, abstract and dissertation, if not given at the time of the examination, will be indicated by the signatures of all Committee members except the Chairperson on the Dissertation Approval page.

It is the student's responsibility to deliver copies of the Dissertation to the major Research Advisor and to his/her department to satisfy final department requirements. At this point the student will complete the "Boston University Mugar Memorial Library Thesis and Dissertation Approval" form (see the list of forms in Section 15), and the Department Graduate Associate Chair will sign approval.

It is the student's responsibility to visit the Department Office to have the Approval page verified BEFORE submitting it to the Library. One copy of the Approval page and Title page will be retained by the Department Office for recording purposes.

Doctoral candidates are expected to submit the significant results of their research to recognized journals for publication.

12.9 Library Submission

It is the Department Office's responsibility to ensure that the Approval page for the dissertation has been signed by all the Committee Members (except the Chair). The student's record and account balances should be checked at this time. When it is verified that the student has completed the necessary requirements, the Department Office will initial the "Mugar Memorial Library Thesis and Dissertation Approval" form and allow the student to proceed to the Library.

The student is required to deliver the pink copy of the Mugar library form, signed by the Library representative, to the Department Office. After receiving the pink copy of the Library form, the Department Office will submit the student's file to the Graduate Programs Office for final graduation review.

It is the responsibility of the Graduate Programs Office to ensure that the University records reflect that the candidate has completed all necessary requirements for his/her Ph.D. degree and that the student's name appears on the official graduation list.

13 GRADUATION

A "Diploma Application for the Degree of Doctor of Philosophy" form must be submitted by the deadline indicated in Section 14, or, at the time the dissertation is submitted to the Library, whichever is earlier. The Department in conjunction with the Graduate Programs Office will advise the student of the graduation proceedings. It is the student's responsibility to inform the Graduate Programs Office of his/her current address.

14 DEADLINES

MASTER of SCIENCE STUDENTS

Official Graduation Date:	January 25, 2008	May 18, 2008	September 25, 2008
Diploma application to be received in the Graduate Programs Office*:	November 1, 2007	February 1, 2008	July 1, 2008
Thesis proposal submission:	August 31, 2007	December 20, 2007	May 13, 2008
Thesis defense:	January 4, 2008	April 24, 2008	August 22, 2008
Approved and signed thesis documentation from Mugar Library to be turned in to the Graduate Programs Office:	January 11, 2008	May 1, 2008	August 29, 2008

Ph.D. STUDENTS

Official Graduation Date:	January 25, 2008	May 18, 2008
Dissertation Prospectus due to Student's Research Committee:	A MINIMUM of two weeks prior to the Defense	
Diploma application due in the Department Office*:	November 1, 2007	February 1, 2008
Dissertation abstract (350 words) due in the Department Office:	A MINIMUM of three weeks prior to the Final Oral Examination	
Schedule of Final Oral Examination due in the Department Office:	A MINIMUM of two weeks prior to the Final Oral Examination date	
Last day to hold Final Oral Examination:	January 4, 2008	April 11, 2008
Approved and signed dissertation due in the Department Office**:	January 11, 2008	April 18, 2008

* The diploma application is valid only for the graduation date specified. A new application must be filed if the student does not graduate as planned.

** All Ph.D. degree requirements are complete only when both copies of the dissertation have been approved by the department, accepted by the library, and a bound copy has been submitted to the department.

15 Ph.D. PROGRAM FORMS AND REQUIRED SIGNATURES

The following forms may be required from Ph.D. students throughout the duration of their program. All forms are available in the Department Office.

1. **Withdrawal/Leave of Absence** - To be submitted to the Graduate Programs Office for approval and processing.
2. **Certificate of Full-Time Participation in Graduate Program** - To be signed by the advisor, the Department Graduate Associate Chair and then submitted to the Graduate Programs Office for signature.
3. **General Petition** - To be signed by the advisor and the Department Associate Chair and then submitted to the Graduate Programs Office for approval by the Associate Dean for Research and Graduate Programs.
4. **Request for a Special Service Appointment in Engineering** - To be signed by the Department Graduate Associate Chair and then submitted to the Graduate Programs Office for approval by the Associate Dean for Research and Graduate Programs. Attach a copy of the individual's curriculum vitae.
5. **College Ph.D. Dissertation Prospectus Defense** - To be signed by all the Readers, Chair and the Department Graduate Associate Chair and then submitted to the Department Office.
6. **Approval Page for the Final Dissertation** - To be signed by all committee members, except the Chairperson, and anyone else required by department.
7. **Ph.D. Dissertation Defense Abstract** - To be signed by the Major Professor and then submitted to the Graduate Programs Office for approval by the Associate Dean for Research and Graduate Programs.
8. **Ph.D. Final Oral Examination** - To be signed by all committee members and the Department Graduate Associate Chair and then submitted to the Department Office for the appointment of a Chairperson.
9. **Research Guide for Writers of Thesis and Dissertations** - Instructions for preparing the dissertation for submission to Mugar Library. Visit www.bu.edu/library/guides/theses/index.html.
10. **Boston University Mugar Memorial Library Thesis and Dissertation Approval** - Four page form to be submitted to the Department Office for final approval prior to Library submission.
11. **Diploma Application** - To be signed by the student and then submitted to the Department Office.
12. **Survey of Earned Doctorates** - This questionnaire should be completed at the time of library submission, signed by the student and returned to the Graduate Programs Office.

16 DIRECTORY

16.1 Dean of the College of Engineering

- * Kenneth R. Lutchen
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(617)353-2800 klutch@bu.edu

16.2 College of Engineering Department Chairmen

- * John Baillieul
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- * Solomon Eisenberg, Chairman *ad interim*
Department of Biomedical Engineering
44 Cummington Street
(617) 353-2805 sre@bu.edu
- * David Castañón, Chairman *ad interim*
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(617) 353-2811 dac@bu.edu
- * Uday Pal, Chairman *ad interim*
Department of Manufacturing Engineering
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16.3 College of Engineering Department Graduate Associate Chairs and Graduate Committee

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- * Associate Dean M. Selim Ünlü (ex-officio)
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- * Cheryl Kelley (non-voting)
Director of Graduate Programs
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16.4 College of Engineering Department Graduate Administrators

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16.5 College of Engineering Graduate Programs Office 48 Cummington Street, Second Floor, (617) 353-9760

- * Director of Graduate Programs
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- * Graduate Admissions
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M. Isabel Tereso, Room 208, mit@bu.edu
- * Master of Science Records
Linda Hession, Room 204, hession@bu.edu
- * Financial Aid and LEAP
Helaine Friedlander, Room 206, hrf0@bu.edu