BU Division of Systems Engineering

Graduate Student Handbook for PhD Candidates

Fall 2016
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College of Engineering GPA Requirement for Awarding Master of Science, Master of Engineering and PhD degrees

Master’s students must earn a grade point average of at least 3.00 in the set of courses used to satisfy the program requirements for the degree.

Doctoral students must complete all degree program requirements and earn a cumulative grade point average of at least 3.00 to be awarded a degree. The cumulative grade point average includes all coursework taken after matriculation and all courses completed prior to matriculation submitted in fulfillment of degree requirements.

College of Engineering Graduate Student Academic Standards Policy

Academic Standards
The academic progress of every graduate student is reviewed at the end of each semester. Failure to make satisfactory progress and remain in Good Standing can result in Academic Probation, Suspension for a stated time or until stated conditions are met, or Dismissal, as detailed below.

Grades of C– or lower are not acceptable for master’s degrees; Grades of C+ or lower for PhD students are interpreted as failures.

Good Standing
Students maintain good academic standing when they: (1) earn a semester GPA of at least 3.00 (students enrolled only in Pass/Fail courses are exempt from the semester GPA standard); and (2) maintain a cumulative GPA of at least 3.00.

Academic Probation
A student is put on Academic Probation when s/he earns a semester or cumulative GPA below 3.00. Students on Academic Probation may have their financial aid discontinued. In the event that the semester or cumulative GPA is below a 2.00, a student may be dismissed from the program.

Students are reviewed after one semester on Academic Probation. Those who earn a semester and cumulative GPA of 3.00 or above will return to Good Standing. Those students who do not achieve Good Standing (as defined above) after the probationary semester will be subject to Academic Suspension, Dismissal, or an additional semester of Academic Probation as determined by the College on a case-by-case basis.

Academic Suspension
A student on Academic Probation faces Academic Suspension or Dismissal when s/he has not achieved Good Standing (as defined above) after the most recent semester of Academic Probation. Specifics regarding Dismissal or the duration and terms of the Academic Suspension will be determined by the College on a case-by-case basis. Dismissal results in permanent separation from the University. Appeals of Dismissal or Suspension are directed to the Associate Dean for Academic Programs.

Reinstatement after Academic Suspension
Students who have fulfilled their period of Academic Suspension must meet with their academic advisor and must also reestablish their standing in the College by contacting the College of Engineering Graduate Programs Office.
Satisfactory Academic Progress for PhD Students

The College of Engineering is committed to five full years of financial support for graduate students in the CoE PhD program who maintain Satisfactory Academic Progress. This support will be in the form of Teaching Fellowships, Research Assistantships, or Graduate Fellowships. Funding beyond five years is generally provided (but not guaranteed) to students who are working productively toward the PhD degree. The following achievements are required to maintain Satisfactory Academic Progress:

- Students must complete the required coursework with a B average (GPA of 3.0) or better and pass the PhD qualifier exam within the allotted time frames. Thereafter they need to complete a Dissertation Prospectus and a Dissertation. Details on the course requirements and qualifier exams are found on the respective departmental or division web sites.

- Students are required to find a research home and funding no later than 12 months after beginning the program. The preponderance of the funding arises from extramural sources such as fellowships, training grants and research funding from grants of individual faculty. Once securing a funded research home the department/division guarantees continued funding through the 5th year. Typically this funding will derive from extramural sources. If, however, bridge resources are required from the departmental/division, the department/division can require that the student be a teaching fellow for the time they are being supported.

The inability to find a faculty research supervisor willing to serve as a research supervisor by the end of 12 months and with funding is initially interpreted as not making satisfactory progress toward the PhD degree. In rare cases, after the first 12 months a student is able to identify a faculty willing to serve as a research supervisor but neither the faculty nor the student is able secure extramural funding for the second year. This student can petition and request one additional year of funding from departmental or division resources. Such a request will need to convey to the chair or division head that the student has found a research advisor willing to supervise the student and that the advisor and/or student have a concrete plan to secure extramural funding sources following the additional year. Decisions to support this request are at the discretion of the department chair/division head. If no such funding has emerged after the second year, these students will be deemed as not making satisfactory academic progress and they may not be permitted to complete their PhD studies.

- After joining a laboratory in accordance with the conditions above, students register for research credits each semester and summer they work in that laboratory. If the supervisor feels the student is not making satisfactory progress, the supervisor will provide a 4-month warning letter (equivalent to a semester or summer). If the progress remains unsatisfactory, the faculty will dismiss the student from their laboratory. The student must then either find an alternative funding source from an individual faculty member or leave the program. After dismissal, the student has one summer or academic semester to find alternative support. During this period, the department or program is under no obligation to find support for the student but may choose to do so, at the discretion of the department/program leadership.

Any egregious violation of academic or research ethics may result in immediate dismissal from the program at any stage with no opportunity for re-admission.
College of Engineering Master of Science and Master of Engineering degrees “with Engineering Practice”

The College of Engineering offers an Engineering Practice degree option to students in all of its Masters programs. Engineering Practice is a valuable opportunity for a student at the masters level to complete an approved internship integral to their program of study, thereby allowing them to develop additional technical and professional skills. Students interested in the Engineering Practice degree option must apply and meet the requirements outlined below. Students successfully completing the Engineering Practice degree option of their program will earn the accompanying degree designation (e.g., Master of Science in Electrical Engineering with Engineering Practice).

Internships used to complete the degree requirements must be relevant to the student's program of study and must go through a program level approval process. Satisfactory completion of the requirement is determined by the program and then formally recorded by the Graduate Programs Office.

Requirements and Grading

- An internship site and project must be approved by the student’s faculty advisor.
- A mid-point review between the student and the internship supervisor must be conducted and submitted.
- Before the end of the semester in which the internship takes place, a final report must be submitted and reviewed by the Academic Advisor.
- Students receive a grade of Pass or Fail. The final grade is based on satisfactory completion of all requirements and is determined by the academic advisor in consultation with the internship supervisor.

For International Students

- International students must have completed two semesters in full-time status to be eligible to begin an internship in the United States, and they must complete additional paperwork with the BU International Students and Scholars Office (ISSO) after registration.
- International Students with an off campus internship must complete the Curricular Practical Training (CPT) form, and bring the approved Engineering Practice Approval form and the CPT form to the ISSO for review and approval for off-campus curricular practical training.

Summary of Course Requirements for SE PhD Candidates

Post-BS PhD Students (Post-Bachelor’s)

Post-BS PhD students are required to complete a minimum of 64 credits applicable to their degree. Of this total, 32 credits are the courses required to earn the MS in Systems Engineering (see the MS (Thesis) Program Planning Sheet in this Handbook). Students will apply to graduate with the MS after successful completion of the PhD Prospectus Defense. A minimum of 16 research/dissertation credits is required. Students should consult their Department Graduate Associate Chair or Division Associate Head for further information.
Only grades of P, F, or J will be assigned to research/dissertation credits.

**Lab Rotations** – All PhD students are required to participate in laboratory rotations and enroll in SE 900 Research during their first academic year. During these rotations (typically two), students will become familiar with research activity within departmental laboratories. These rotations will then help students identify the laboratory in which they will perform their Dissertation research. The following is an outline of the administrative issues and policies regarding SE 900:

- All PhD students must register for SE 900 in their first and second semesters of matriculation in SE. Students will register for a minimum of two in the fall and two or more credits in the spring semester, for a total of minimum of 4. The course is graded Pass/Fail.
- Rotations generally last 6-8 weeks.
- To do a rotation with a faculty member who does not have a primary or secondary appointment in SE, students must petition and receive permission from the SE Graduate Committee using the SE petition form (available online).

Postbachelor’s PhD students are required to declare the MS degree upon fulfillment of the degree requirements. A completed prospectus is used to satisfy the MS project or thesis requirement.

**Math Requirement** selected from approved list (located in the handbook and online). It is strongly recommended that this be completed during the first year. Both passing the oral qualifier exam and satisfying the math requirement are required in order to achieve PhD candidacy!

**Teaching Practicum (SE 801 and SE 802)** All SE PhD students are required to teach two semesters. Typically the first teaching assignment (SE 801) is during the second year and the second assignment (SE 802) is during the third year. SE 801 and SE 802 each count for 4 credits and students require permission of their research advisor if they want to take an additional course during the semester that they are teaching.

Post-Bachelor’s PhD students must complete 64 total credits (formal courses plus research credits) prior to graduation, earning at least 56 credits at BU. If approved by the student’s advisor and the SE Graduate Committee (using the SE petition form, available online), additional courses that do not necessarily satisfy a program requirement but would be beneficial to the student’s research are allowed.

All Post-Bachelor’s PhD degree students may declare a Master of Science degree when they complete the prospectus – THIS IS NOT AUTOMATIC. Please see the Division Graduate Programs Manager for details.

**Post-MS PhD Students (Post-Master’s)**

There are no structured course requirements for post-master’s PhD 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 Division Head or Division Associate Head to determine specific departmental requirements. Post-master’s PhD 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 PhD program. Post-master’s PhD students are not permitted to declare an MS degree.

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 PhD students who obtained their Engineering Master’s degree at Boston University may petition to apply credits not used for their Master’s degree to their PhD 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 Division Associate Head before submitting it to the Graduate Programs Office for processing.

Only grades of P, F, or J will be assigned to research/dissertation credits.

**Lab Rotations** – All PhD students are required to participate in laboratory rotations and enroll in SE 900 Research during their first academic year. During these rotations (typically two), students will become familiar with research activity within departmental laboratories. These rotations will then help students identify the laboratory in which they will perform their Dissertation research. The following is an outline of the administrative issues and policies regarding SE 900:

- All PhD students must register for SE 900 in their first and second semesters of matriculation in SE. Students will register for a minimum of two in the fall and two or more credits in the spring semester, for a total of minimum of 4. The course is graded Pass/Fail.
- Rotations generally last 6-8 weeks.
- To do a rotation with a faculty member who does not have a primary or secondary appointment in SE, students must petition and receive permission from the SE Graduate Committee using the SE petition form (available online).

**Math Requirement** selected from approved list (located in the handbook and online). It is strongly recommended that this be completed during the first year. Both passing the oral qualifier exam and satisfying the math requirement are required in order to achieve PhD candidacy!

**Teaching Practicum (SE 801 and SE 802)** All SE PhD students are required to teach two semesters. Typically the first teaching assignment (SE 801) is during the second year and the second assignment (SE 802) is during the third year. SE 801 and SE 802 each count for 4 credits and students require permission of their research advisor if they want to take an additional course during the semester that they are teaching.

**All PhD Students**

- **SE 801 and SE 802 Teaching Practicum I and II** (4 credits each) All PhD students assigned to teach for the first time are required to register for SE 801 during the semester of their formal teaching assignment. During the second assignment, students must register for SE 802. During the semester in which the student teaches, he/she may only register for 8 credits (SE 801 or SE
802 plus 4 credits of SE 900). Students may take a structured course while teaching only if they receive permission from their research advisor (credit limit would then be 10 – 4 for SE 801 or SE 802, 4 for the course and 2 for SE 900).

- **Responsible Conduct of Research Requirement**: All College of Engineering PhD students are required to complete the Advanced Responsible Conduct of Research program prior to completing the Prospectus. The Advanced RCR program includes an online module and four live discussion workshops. Information about the modules and a registration link are online.
- All PhD students are required to fulfill the **Math Requirement** no later than the end of their fourth academic semester. The list of courses will be reviewed periodically by the SE Graduate Committee.
  - **Post-BS students**: Complete with grade B+ or better one of:
    - Dynamic Systems Theory (SE/EC/ME501)
    - Optimization Theory and Methods (SE/EC524)
    - Stochastic Processes (EC505)
    - Probability with Statistical Applications (EK500)
    - Dynamic Programming and Stochastic Control (SE/EC/ME710)
    - Advanced Stochastic Modeling and Simulation (SE/ME714)
  - **For Post-MS students**:
    - Post BS requirement or
    - Submit evidence of successful completion B+ or better of equivalent course as determined by the SE Graduate Committee.

**Finding a Research Home**

**Research Opportunities in the Division** – Most students choose to do their research with a faculty member from the SE Department or affiliated research centers. To find out more about specific research programs, please visit the individual faculty member webpages via the SE, Center for Information and Systems Engineering (CISE) or faculty website.

**Research Project** – A major requirement for the PhD degree is a research-based dissertation. Each student is responsible for finding a research project, conducting scientific studies under the guidance of an approved faculty member, presenting the proposal and results to the general scientific community in a public defense and finally turning in a dissertation to be bound for the library and the SE Division.

**Academic vs. Research Advisors** – Each new student is assigned an academic advisor when entering the program. Incoming PhD students will be notified about their advisor prior to registration by the Graduate Programs Manager. The student’s academic advisor can provide general information/guidance and help the student to complete his/her course registration for the first year.

**Research Rotations** – PhD students will participate in laboratory rotations (minimum of two) during the first year. This provides the students an opportunity to gain exposure to more than one research area and to help in identifying a good match with a research advisor. After finding a lab, the research advisor will be in charge of the student’s research project and will help coordinate the student’s schedule towards fulfilling all of the graduation requirements. PhD students are expected to choose a research advisor no later than the end of the second semester of matriculation (April 30, 2016 deadline). When a student chooses his/her research advisor, that person automatically becomes the student’s academic
advisor as well.

Who Can Be A Research Advisor – For PhD students, any full-time member of the SE faculty, or any affiliated or adjunct faculty member who has an appointment with the Division, is eligible to serve as a research advisor.

Finding a Research Advisor and Project – Occasionally students enter the program with a specific research advisor in mind and may even plan to work on a specific project. The majority of students, however, will utilize the first two semesters to determine what their specific interests are in the field of systems engineering and identify the opportunities for funding in a professor’s lab. PhD students typically connect with their research advisors through the mechanism of their lab rotations. In general, the procedure involves three steps: (1) doing rotations and deciding upon a research area; (2) joining a specific lab; and (3) developing a dissertation research project. A minimum of two rotations must be completed by the end of the first academic year. RA positions should begin May 1.

Students can gain information about steps (1) and (2) through coursework, informal discussions with faculty and, most importantly, the lab rotations. An easy way to find out what is available is to check the list of current Faculty Research Interests and SE Laboratory and Research Center Descriptions, available on the SE website.

Another valuable way of learning more about specific research opportunities is to speak with other graduate students who are currently working in the various SE faculty labs. The best measure for learning about working in a specific lab is to make an appointment to speak with the faculty member in charge of a lab you are interested in. Some useful questions to ask him/her are:

1. What projects are currently going on and what projects are planned for the near future?
2. What background is required to work in the lab?
3. How is the lab funded and is there the possibility of funds for a new graduate student?
4. What expectations does the faculty member have of graduate students?
5. If the potential advisor has been at BU for at least a few years, does he/she have a strong history of training students in a timely manner? Have his/her students generally been successful?

Once a student finds a research opportunity and has the consent of a faculty member to be his/her advisor, the process of developing a research project begins.

Patent Policy Agreement – Students who receive support from sponsored research programs or who make significant use of BU funds and facilities are required to sign the BU Patent Policy Agreement. Seek counsel with your faculty advisor about this policy pertaining to intellectual property. A signed form is required before a student can be paid. The Patent Policy Agreement form is on the Division website.

Doctor of Philosophy Degree Requirements

All Engineering PhD students must adhere to and meet the PhD degree requirements as set forth by the College of Engineering. Additionally, SE PhD students must also meet any specific degree requirements as set forth by the SE Department.
The general requirements for all PhD students in SE include:

- Fulfillment of course requirements
- Passing the qualifying exam (written and oral)
- Advanced Responsible Conduct of Research program
- Prospectus Defense
- Dissertation Defense

A cumulative grade point average of 3.0 must be maintained and no course with a grade lower than B- can be counted towards the degree.

**SE PhD Qualifying Exam and PhD Candidacy**

**SE PhD Qualifying Exam**

Students must demonstrate they have an appropriate level of preparation for doctoral studies and their degree of understanding of fundamental materials by passing the SE Qualifying Exam. The SE Qualifying Exam is taken during the early summer (usually on a Tuesday and Thursday between graduation and Memorial Day) following the first academic year in the graduate program.

The exam consists of three topical sections. Students select three of the following five sections:

1. Dynamic Systems Theory (SE/EC/ME 501)
2. Continuous Stochastic Processes (EC505) or Discrete Stochastic Processes (EK500 and SE/ME 714)
3. Optimization (SE/EC 524)
4. Dynamic Programming and Stochastic Control (SE/EC/ME 710)
5. Nonlinear Systems and Control (SE/ME 762)

The exam will have a written and an oral part. The written examination is closed book. For the oral part, students will be asked to appear before the examination committee to (1) make a 20-minute research presentation related to one of the research rotations, and (2) answer questions. The questions will be on the research presentation, the student’s academic background and may include questions that arise from the written part of the exam. The department will provide guidance for students to prepare for the oral qualifier exam towards the end of the spring semester.

**Policy Regarding “Partial Pass” and “Fail” Grades for the PhD Oral Qualifier Exam:** Results from the Exam as a whole are evaluated by the SE Graduate Committee. In the event that a student fails all or part of the exam, potential outcomes include remedial coursework or an opportunity for a second oral exam on all or part of the material.

Failure of a second attempt at the qualifier exam: There is no automatic recourse for this outcome. The student may apply to transfer to the MS program or MEng program.
**PhD Candidacy**

Upon successful completion of the SE PhD Qualifying Exam and the Math Requirement, a student becomes formally accepted to PhD candidacy. A PhD candidate has a maximum of five (5) years after passing the qualifying exam to complete all degree requirements for graduate studies. If not completed within five years, the student must petition the College of Engineering Graduate Committee for an extension using the College of Engineering petition form (available online).

The petition to extend Candidacy should include the following material:

- Major reason(s) for delay
- How those delays have been resolved
- Evidence of research progress
- Detailed timeline and evidence that timeline can be adhered to
- Letter of support from advisor that addresses these issues

The College of Engineering Graduate Committee will determine whether or not a candidate may extend his/her participation in the PhD program. More than one petition to extend the completion date of degree requirements is rarely approved, so the student should be very sure that they will finish their dissertation by the date they propose on the extension.

**Prospectus and Dissertation**

**Prospectus Requirements**

**Responsible Conduct of Research Requirement** – All College of Engineering PhD students are required to complete the Advanced Responsible Conduct of Research program prior to completing the Prospectus. The Advanced RCR program includes an online module and four live discussion workshops. Information about the modules and a registration link are online. PhD candidates are required to complete the Responsible Conduct of Research (RCR) requirement before they can receive the post-prospectus stipend rate increase.

**Dissertation Topic** – A research problem is selected after initial discussions between the research advisor and the student. The development of a dissertation topic is typically a cooperative effort between the student and research advisor. Commonly, the advisor initially suggests a problem to be addressed, but the student is expected to contribute ideas and thought as to how to approach the problem.

**Prospectus Committee** – By the end of the sixth semester following matriculation, PhD candidates are required to form a Prospectus Committee and defend a dissertation prospectus. A Prospectus Defense will be scheduled by the student. Prospectus is defined as a public oral presentation of the proposal is held to describe the research and demonstrate the student’s preparation. The PhD Prospectus Defense Committee must consist of at least four (4) members.

The student’s research advisor will be the chairman of the prospectus committee but will not be a voting
member of the committee. Membership of the Prospectus Committee constitutes the nucleus of the Final Oral Thesis Examination Committee (Dissertation Defense).

If a researcher from outside the University serves on a PhD student’s committee, a Special Service Appointment Form (available online) must be completed and submitted to the Division Graduate Programs Manager for division approval. The completed form and a copy of the person’s curriculum vitae, with the Associate Chair for Graduate Studies’ signature, will then be submitted to the Graduate Programs Office. The Prospectus Defense Committee is charged with assessing the appropriateness of the research problem and the student’s preparation, based on the written proposal and the oral presentation. The Prospectus Committee must approve that the Prospectus is at a stage appropriate for scheduling the examination via their signature on the PhD Prospectus Defense form.

Written Prospectus –Before undertaking this phase, the student should consult the College’s Guide for Writing Theses & Dissertations which is located on the SE website under “Online Forms and Documents”. The Prospectus document should include a signature page, a statement of the problem to be investigated, its background and significance, methods and approach(es) to be followed for its resolution, preliminary results, anticipated timetable for completion and pertinent bibliography. The format is similar to a typical research proposal.

• The prospectus should specifically document the anticipated contribution of the work to the body of knowledge
• A separate page listing the proposed title, author’s name, research advisor’s name and an abstract of approximately 150 words
• The prospectus should address the anticipated contribution of the work to the body of knowledge and the format must be similar to that of proposals submitted to a Federal Agency
• There is a 20 page (single-spaced) limit on the scientific portion of the proposal, which includes tables and figures but does not include the list of references
• The prospectus should include an up-to-date copy of the student’s curriculum vitae (not part of the 20-page limit)

The PhD Prospectus Defense form (available online) is to be handed in to the Division Graduate Programs Manager two weeks prior to the defense along with the abstract. The student must obtain the committee’s ORIGINAL signatures on this form, which indicate that they have read the Prospectus document and approve that the examination be scheduled. In addition, the student must fill out the top section of this form indicating the title, date, time and location of the Prospectus Defense. The student submits this completed form immediately following the Prospectus Defense examination for approval by the Associate Chair for Graduate Studies.

Scheduling – Prior to scheduling the Prospectus Defense, the student must provide a copy of the Prospectus document to all members of the Prospectus Defense Committee. The student must also confirm with the committee members a date, time and location for the examination. The Division Graduate Programs Manager will be responsible for providing publicity for the student’s Prospectus Defense to the SE students and faculty.

Conduct and Length of the Oral Examination for the Prospectus Defense – The faculty research advisor should chair the Prospectus Defense, beginning with the introduction of the PhD student and his/her academic background. The student’s presentation should last 20 to 30 minutes. The student should be able to defend his/her knowledge of the mathematical, physical and analytical tools to be used and how
they may relate to other areas outside of his/her particular project. During this period, Prospectus Committee members or the audience may ask questions. 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 Prospectus Committee remains to complete its assessment of the prospectus proposal examination.

**Assessment** – The Prospectus Defense Committee recommends that the student should pass, fail, or be given additional requirements (e.g., an additional written progress report or additional studies) to be completed no later than one year from the Prospectus Defense examination. In the case of failure, the Prospectus Committee recommends the appropriate action: a recommendation of failure may include a suggestion that the student re-take the Prospectus Defense exam or that the student be terminated from the PhD program. In the latter case, the student has the option of pursuing an MS or M.Eng degree but must complete all the requirements for that degree.

As of Fall 2005, **all Post-Bachelor’s PhD degree students should declare a Master of Science degree** when they successfully complete their PhD Prospectus Defense. This is not automatic and the student needs to complete an MS Program Planning Sheet and apply online for graduation.

If a student’s Prospectus Defense deadline has passed, he/she needs to petition the SE Graduate Committee for an extension, including indicating a timeline for completion of the prospectus.

**Reporting on Student Progress** – The chair of the Prospectus Defense Committee will complete the “Prospectus Defense Results” section on the PhD Prospectus Defense form. 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 Division Graduate Programs Manager (who will be responsible for submitting to the Associate Chair for Graduate Studies for final approval).

Before the Prospectus Defense ends, the committee must indicate on the PhD Prospectus Defense form the date for the next committee meeting (at least once in the next 12 months) and indicate expected milestones for the next post-prospectus thesis committee meeting. Required revisions to the proposal should be completed satisfactorily before a final “Pass” grade is given.

**Annual Progress Report** – Dissertation committee meetings are to be held on a regular basis in order for the student to report progress and the committee to provide feedback. As a minimum, committee meetings will be held annually. The student must forward to his/her committee a written report (PhD Annual Progress Report) detailing progress towards milestones and the next planned steps at least one week before each planned meeting. It is the responsibility of the student to contact the committee members and schedule the committee meetings.

**Course Registration After Prospectus** – After passing the Prospectus Defense, students will enroll for eight credits of SE 900 each semester until the total credit requirement is met (64 credits for Post-BS, 32 credits for Post-MS). Once the student has fulfilled the total minimum credits requirement, he/she will register for two SE 900 credits each semester until they graduate.
Dissertation Requirements

Written Dissertation – Candidates shall demonstrate their abilities for independent research and scholarship by completing a doctoral dissertation in their field of study. The dissertation will be primarily guided by the first reader (advisor), with the advice of the other members of the Dissertation Defense Committee. The dissertation should represent original scientific/engineering contributions that are appropriate for publication in a recognized peer-reviewed journal. The dissertation is defended at a presentation open to the entire BU community.

Guidelines for preparing the dissertation and its abstract, according to the requirements of the University Microfilms International, are distributed by Mugar Library to all doctoral candidates and are available on the SE website.

Although students will have an opportunity to make final revisions to the dissertation and abstract after their Final Oral Examination (Dissertation Defense), they should not regard their Final Oral Examination version as a “rough draft”.

**Final Oral Examination (Dissertation Defense)** – The PhD Final Oral Examination form is located on the SE website under “Online Forms and Documents”. The Dissertation Defense 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 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 an expertise in his/her field of research specialization.

**Final Oral Examination (Dissertation Defense) Committee** – In preparation for the Dissertation Defense, it is the candidate’s responsibility, in conjunction with that of his/her research advisor, to appoint a Dissertation Defense Committee. This committee usually consists of the faculty members who participated in the Prospectus Defense, and have followed the student’s progress and annual progress meetings. The committee consists of five (5), including 4 readers and a Chair. The Chair may not also serve as a reader.

If a researcher from outside the University serves on Dissertation Defense Committee, a Special Service Appointment Form (available on the SE website under “Online Forms and Documents”) must be completed. The completed form and a copy of the person’s curriculum vitae, with the Associate Chairman for Graduate Studies’ signature will be submitted to the Graduate Programs Office after receiving departmental approval. This form does not have to be re-submitted if it was approved for the Prospectus Defense.

The Division Graduate Programs Manager will appoint the chair for the Dissertation Defense, in consultation with student and advisor.

**Scheduling the Final Oral Examination (Dissertation Defense)** – It is the student’s responsibility for scheduling a date, location and time with all the Dissertation Defense Committee members for the examination. Conference room reservations can be requested via the SE website.

**At least three weeks prior to the Dissertation Defense date**, the candidate must submit the PhD Final Oral Abstract form to the Division Graduate Programs Manager. The student must also provide an
At least two weeks prior to the Dissertation Defense date, the candidate must submit the PhD Final Oral Examination form to the Division Graduate Programs Manager. Before submitting this form, the candidate must have provided a copy of the dissertation document to all members of the Final Oral Examination committee and obtained their ORIGINAL signatures on this form indicating 1) that they have been provided a copy of the dissertation and 2) agree that it is ready to be defended. This form must also contain the date, time, location and abstract.

Conduct and Length of the Final Oral Exam – The faculty research advisor or chair should introduce the candidate and include a brief academic background description. The candidate should restrict the length of the examination to approximately one-hour. During this period, either the Dissertation Defense Committee members or audience may ask questions of clarification. The chair should guard against digression and inappropriate questioning during the presentation. After the presentation, a reasonable period of questioning will follow, and then the audience will be dismissed. The Dissertation Defense Committee may wish at this time to ask additional questions of the candidate. Following this additional questioning, the candidate should be excused and the committee should complete its assessment of the examination.

Assessment – The Dissertation Defense Committee is charged with assessing 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 chair’s responsibility to call the candidate back after the Dissertation Defense Committee has reached a decision. The chair will advise the student of the committee’s decision. At this time the candidate will be advised of any changes that must be made to the final title, abstract or dissertation document, with a deadline provided by the Dissertation Defense Committee.

Reporting – The College’s PhD Final Oral Examination Form must be completed at the examination, with specific indication of whether the title, abstract and dissertation are acceptable as they stand. If ALL requirements are acceptable, the committee members should sign the signature pages of the dissertation. If there is some rework to be done, this is to be noted on the Final Oral Exam form. Dissertation Defense Committee members should sign off on the form but will refrain from signing the signatures page of the dissertation until all conditions have been met UNLESS faculty will be traveling at the time of library submission in which case all but one (usually the advisor) Committee member may sign the signature pages. The last signature will be added when all revisions are completed.

Dissertation Approval and Library Submission – The signatures of the Dissertation Defense Committee members on the dissertation signatures page, if not given at the Final Oral Examination itself, will indicate final approval of the title, abstract and dissertation. Once signatures have been obtained, the student must submit the following (minimum) unbound dissertation copies to the Division Graduate Programs Manager for binding: one copy for the SE Department and one personal copy for the advisor. Copies for the Dissertation Committee are optional and to be submitted for binding at the candidate’s discretion. All copies must have original signatures pages.

The Associate Chair for Graduate Studies gives final approval on the Final Oral Examination form. The student will then follow the electronic submission guidelines provided by Mugar Library. The Division
Graduate Programs Manager will provide departmental electronic approval for the student upon seeing the 1) original signatures page and 2) title page.

The Division Graduate Programs Manager will handle the binding of the additional dissertation copies. The cost for hardbound copies is $10.00 per copy (subsidized by the SE Division). Dissertations to be hardbound are sent to an external bindery once a year (early fall). Students who submit a personal copy for binding should be sure to leave a correct forwarding address after graduation so that their hardbound copy of the dissertation can be mailed.

**PhD Program Completion Time Schedule**

- Course requirements should be completed as early as possible.
- After all credit requirements have been fulfilled, PhD students are permitted to audit one course per semester in order to continue to take advantage of course offerings.
- It is highly recommended that the Math Requirement be completed during the first two semesters.
- The SE Oral Qualifier Examination is taken in early summer (usually May between graduation and Memorial Day) following the first academic year. Schedules will be set by the SE Graduate Committee.
- The Prospectus Defense should be presented by the end of the sixth semester from matriculation.
- PhD students have five years to complete the dissertation after becoming a PhD candidate. Meetings with the dissertation committee must occur at least annually following the Prospectus Defense, and must be documented by submission of the PhD Progress Report form to Division Graduate Programs Manager.

**Financial Information**

Students receiving any form of financial support for graduate studies are not permitted additional employment without prior written approval from both the student’s advisor and the SE Graduate Committee. These forms of financial support include BU Fellowships (Dean’s, SE, Photonics, etc.), Training Grant Fellowships, Research Assistantships and other external Fellowships (NSF, NIH, foreign government fellowships or other foundations).

**Stipend Paychecks** – All students are expected to have a bank account in the U.S. Direct Deposit of payments to your bank account is the norm for most students. If you elect not to use direct deposit, paychecks can be picked up at the BU Payroll Office at 25 Buick Street on the last Friday of the month. Students with one-academic-year BU fellowships (Dean’s, SE, Photonics, etc.) should secure a funded Research Assistantship no later than the end of their first academic year (April 30).

**Research Fellowships** – Research Fellowships are offered by individual faculty members with sponsored research grants. A Research Fellow is a member of a research group in a laboratory or center. The position offers close association with members of the faculty and is a very effective arrangement for graduate study. Work on the dissertation project is normally part of a Fellow’s assignments. RF’s are expected to work full-time, with time allowed for courses during the academic year.
Research Fellowships and academic obligations constitute a fulltime commitment. In exchange for a per-semester support stipend, students agree to work a minimum of 20 hours/week if the semester falls within the academic year, and 39 hours/week if it falls within the summer term. Students must have prior written approval from their research advisor and the Associate Division Chair before undertaking any other employment, either inside or outside the University. Because this appointment requires service to the University, students should be aware that taxes may be deducted from the stipend portion of their award. Students also agree to sign the University's standard patent agreement form. Students further understand that as an RF, they will receive a tuition scholarship for credits leading toward their degree during the period of employment. Students will obtain written approval from their advisor if they wish to register for coursework in excess of 10 credit hours per semester. Students understand they must register for each semester in a timely manner and complete required payroll forms as requested. Students also understand that they may only work under one Research Fellowship at a time.

Research Fellows are paid weekly over 17 weeks in the Fall and Spring and over 18 weeks in the Summer. Fall semester paychecks are issued from September through December; Spring semester paychecks are issued from January through April; Summer semester paychecks are issued from May though August.

**International Students**

International Students understand that their visa and work-permission status must be up to date before they can begin work. They further understand US visa regulations prohibit any additional work, either on or off campus, during the duration of the RA appointment.

**US Citizens and Permanent Residents**

US Citizens and Permanent Residents understand that the RA scholarship is a form of financial aid and it may affect eligibility for certain need-based funds, including but not limited to: Direct Loans, Federal Work-Study, and Perkins Loans. Students also understand that if they have already received need-based funds prior to the RA appointment, terms of their financial aid package may be adjusted.

**College of Engineering policy on stipend levels:**

- All incoming PhD students on a fellowship will receive the same monthly stipend at the base rate
- Upon fully passing the Oral Qualifier Exam, PhD candidates will receive a stipend increase of 5% above the current base rate
- PhD candidates will receive an additional 5% increase once 1) they fully pass the Prospectus Defense and 2) complete the Responsible Conduct of Research (RCR) training

Stipend increases will be implemented no later than the beginning of the next semester (spring, fall, or summer) following eligibility.

**Payroll Set Up** – The Division Graduate Programs Manager will coordinate with other department
managers and Payroll Coordinators to make sure that student funding is set up each semester prior to the account settlement date. In order to be set up on Payroll, students must register according to the Student Payroll-Related Deadlines listed above. First Year PhD students must notify the Graduate Programs Manager when a research advisor and summer funding is confirmed.

- Students must register according to the Student Payroll-Related Deadlines listed above
- Setting-up the student on payroll; Coordinated by the Graduate Programs Manager in conjunction with the Department Grant Administrator overseeing the grant that funds the student’s stipend
- Settling the student’s tuition account by Isabel Tereso in the Graduate Programs Office
- Settling the student’s health insurance payment by Isabel Tereso in the Graduate Programs Office

**Tuition** – RA’s supported full-time by a faculty’s sponsored research grant typically receive tuition coverage. Eligible RA’s receive 8 credits of tuition, applicable to their degree, each semester they serve as an RA during the academic year.

**In order to be paid during the Summer** – Students must register for EK 920S for the Summer I term (0 credits) prior to the start of the summer session. International students must also pre-register for the Fall semester, prior to the start of the Summer term.

The exception to registering for EK 920S are: If you plan to complete your thesis or dissertation during the summer and graduate in September, then you are required to register for two credits of SE 900S.

**Summer Stipends and Tax Withholding** – Students funded on fellowships other than NIH will have FICA taxes withheld from their paychecks during the summer (May, June, July and August).

**Childbirth and Adoption Accommodation for Full-time PhD Students** – The childbirth and adoption accommodation policy for full-time or certified full-time PhD students in good academic standing provides for extensions for academic coursework and other requirements to the primary caregiver of an infant or adopted child. It also provides for a continuation of stipend support for funded students during the accommodation period. Please contact the Graduate Programs Manager for the form. Additional information: [http://www.bu.edu/academics/policies/childbirth-and-adoption-accommodation/](http://www.bu.edu/academics/policies/childbirth-and-adoption-accommodation/)

**SE Travel Award** – The Division of Systems Engineering has a limited number of Student Travel Awards to defray the cost of attending a conference or other worthwhile meeting related to a student’s research. The student must be an author or co-author of a paper accepted for presentation and the paper must be included in the conference/meeting program. The student must also be the one who presents the paper at the conference/meeting.

Every Division student who has passed his/her PhD qualifying exam is eligible for a Student Travel Award. You can request an award before the travel event occurs by contacting your advisor, who can then nominate you by sending a message to the Associate Head, Professor Hua Wang. The message should be accompanied by (a) a copy of the paper abstract, and (b) evidence that the paper is included in the conference/meeting program (e.g., web site containing the program or a page showing where the paper is scheduled in the program).
Each student is allowed one award per calendar year. The award will be a reimbursement of actual expenses up to a limit of $1,000.00 per student. Awards will be made on a first-come-first-served basis during the year. If more requests are received than our budget allows, then the Head and Associate Head will make selections based on the students' qualifications, and with priority given to first-time applicants and students who are still early in their research and can benefit most by attending a conference/meeting.

All awards will be made by check after the travel has occurred and after the student has submitted scanned receipts.

If you have any question about this award, please contact the Division Graduate Programs Manager.

**Logistical Information**

**Previous PhD dissertations** are available for review in the Division. Please see the Division Graduate Programs Manager for access.

**Graduate Student Offices** – New PhD students will be assigned a desk in dedicated SE graduate student offices located at 730 Commonwealth Avenue, Room 303. After the first year, faculty lab supervisors should provide desk space in their labs for Research Assistants. The Graduate Programs Manager will notifying incoming PhD students regarding their individual office assignments and approve room access.

**Printing Facility** - The SE copy room has a color printer, black and white printer, scanner, and copy machine available. Students must request card access to EMB 120.

**Email** – SE uses electronic mail as a medium for official communication. Please be sure to check your BU email account on a daily basis for important information, and make sure that your account is not filled up.

**Mailing address** – Division of Systems Engineering, Boston University, 15 Saint Mary’s Street, Room 118, Brookline, MA 02446.

**Graduate Student Concerns** – Any matters concerning leave of absences, medical leave of absences or maternity leaves should be discussed with the Division Graduate Programs Manager and/or the Associate Division Head for Graduate Studies.

**SE Kitchenette** – There are two small kitchenettes (including a refrigerator, microwave, coffee maker, toaster oven) that are available for faculty, graduate students and staff in EMB and EMA. First year PhD students will have access to the kitchenette adjacent to Room 303. All others should request access to EMB 120.
Staff Directory

SE Graduate Programs Staff
• Professor Hua Wang, Associate Division Head for Graduate Programs, wangh@bu.edu
• Elizabeth Flagg, Division Graduate Programs Manager, eflagg@bu.edu, 617-358-0351

SE Division Staff
• Christos Cassandras, Division Head, cgc@bu.edu
• Ruth Mason, Director, rmask@bu.edu
• Cheryl Stewart, Communications Manager, cste@bu.edu

Center for Information and Systems Engineering (CISE) Staff
• Christina Polyzos, Associate Director, cpolyzos@bu.edu
• Denise Joseph, Administrator, dejoseph@bu.edu

College of Engineering Staff
• Kenneth Lutchen, Dean, klutch@bu.edu
• Solomon Eisenberg, Senior Associate Dean for ENG Academic Programs, sre@bu.edu
• Catherine Klapperich, Associate Dean for ENG Research and Technology Development, catherin@bu.edu
• Domenic Lomanno, Director of Graduate Programs, dlo@bu.edu
• Isabel Tereso, Assistant Director of Graduate Programs, mit@bu.edu
• Linda Hession, Graduate Records, hession@bu.edu
**MS (Thesis) Program Planning Sheet for Post-BS PhD Students**

**Boston University** College of Engineering  
Division of Systems Engineering  
**MS (Thesis) Program Planning Sheet**

Student Name: ____________________________  
Advisor Signature: _________________________  
BU ID ______________

**MS (Thesis) students must take 32 credits all of which must be at the 500 level or higher. The coursework requirements for the MS (Thesis) are as follows:**

**Core** (3 courses):  
**Concentration** (2 courses):  
**Elective** (4-8 credits):  
**Thesis** (4-8 credits):  

**The Practicum Requirement** is satisfied by 4 credits of SE 954 Thesis or SE 950 Research (PhD Only). Courses used to satisfy the Core requirement may not also be used to satisfy the Concentration or Elective requirements. Elective courses may be chosen, with advisor approval, to meet an individual student's academic needs. MS students must also satisfy the advanced technical course requirement by taking at least two 700 level or higher courses from the Concentration areas, or courses approved by the Systems Engineering Graduate Committee in advance. MS students must maintain a cumulative GPA of 3.00 to remain in good academic standing and to graduate. Grades of "C-" or lower are not acceptable for the MS degree. **NOTE:** Courses are color coded to indicate when they are usually offered, in Fall, Spring, or both semester (subject to change). Courses may be offered every other year.

### CORE
(Select one course from each Core area. 12 credits.)

A.  SE/EC 524 Optimization Theory and Methods  
B.  SE/EC 513 Game Theory and Methods  
C.  SE/ME 714 Adv. Stochastic Syst and Models, or IC 505 Stoch Processes, or IC 500 Probability with Statistical Applications

### CONCENTRATION
(Select two courses from one Concentration area.)

#### A. Computational and Systems Biology
ENG BE 505 Molecular Biomechanics  
ENG ME/MS 507 Process Modeling and Control  
ENG ME 560 Precision Machine Design and Instrumentation

#### B. Control Systems
ENG SE/EC 574 Linear Systems Theory  
ENG ME/ME 570 Robotic Motion Planning  
ENG SE/EC/ME 701 Optimal and Robust Control  
ENG EC 702 Recursive Estimation and Optimal Filtering

#### C. Energy and Environmental Systems
CAS EC 511 Game Theory (both semesters)  
ENG SE/EC/ME 543 Sustainable Power Systems

#### D. Network Systems
ENG EC 541 Network Communication Networks  
ENG SE/EC/ME 544 Networking the Physical World

#### E. Operations Research
ENG ME 530 Production Systems Analysis  
ENG SE/EC/ME 543 Sustainable Power Systems

#### F. Production and Service Systems
ENG ME 510 Production Systems Analysis  
ENG SE/EC/ME 543 Sustainable Power Systems

**Elective (4-8 credits). Courses from the Concentrations listed above or suggested below. No more than one Engineering Management Course may be selected from the approved list.)**

1. Course/Semester/Grade ______________________  
2. Course/Semester/Grade ______________________

Suggested Electives:  
CAS EC 511 Object-Oriented Software Principles  
CAS EC 518 Game Theory, ENG SE 700 Advanced Special Topics, GRS EC 716 Game Theory,  
GSM OM 855 Project Mgt, ENG SE 900 Research (PhD Only), SE 925 Graduate Project, or SE 951 Independent Study.

**Thesis:** (4-8 credits of SE 900 Research (PhD Only) or SE 954 Thesis.)

Course/Semester/Grade/Credits ______________________  
Course/Semester/Grade/Credits ______________________

**Fall 2016**