Department of Biomedical Engineering

Handbook of Academic Requirements and Procedures for the Graduate Degrees in Biomedical Engineering

- Master of Science (MS)
- Master of Science with thesis (MS)
- Doctor of Philosophy (PhD)

Revised 09/2020
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1. INTRODUCTION

1.1. Graduate Programs in the Department of Biomedical Engineering
The Department of Biomedical Engineering offers programs leading to the degrees of Master of Science (MS) for students seeking an education at an advanced level in biomedical engineering, and Master of Science with thesis (MS) and Doctor of Philosophy (PhD) for students preparing for careers in which research is a central activity.

1.2. Purpose and Content of the Handbook
This handbook provides a detailed account of the academic requirements and procedures for graduate students in the Department of Biomedical Engineering. The intent is to describe the programs and explain the rationale behind them; to delineate the responsibilities of students, faculty committees, faculty members and the administration of the Department; to promote consistency in procedures and standards; and to provide a basis for communication between the faculty and students regarding expectations for performance and achievement. Although the information in this Handbook is updated on a regular basis, if any conflict exists the decision of the Biomedical Engineering Graduate Committee is final.

1.3. General Information
A general summary of the academic structure is found in the Bulletin of Tufts University for the School of Arts and Sciences and the School of Engineering. Graduate School regulations are found in the "Guide for Graduate Students" available in the Graduate School office or at https://asegrad.tufts.edu/sites/default/files/SOE-grad-handbook-AY20-21_0.pdf.

It is the responsibility of each graduate student to become aware of the academic requirements, procedures and deadlines of the School of Engineering, Graduate School Office of Graduate and Professional Studies, and the Department of Biomedical Engineering.

2. THE GRADUATE COMMITTEE

2.1. Channels of Communication
All communications from students concerning clarification of and petitions for exceptions from the rules described in this handbook should be addressed to the Chair of the Biomedical Engineering Graduate Committee. The Graduate Committee may waive specific requirements if there are conditions that justify such action. This committee comprises faculty members charged with the responsibility of monitoring a student's progress through the rules and requirements delineated in this handbook. The Committee will consist of at least three faculty members of the Department of Biomedical Engineering.

2.2. Graduate Committee Functions
(a) The Chair of the Graduate Committee (GC) serves as the interim academic advisor for all newly admitted students. Depending on their academic or research interests, students will choose their own academic advisors preferably by the end of the first semester (for MS students) or the first year (for PhD students). The academic advisor of an MS or PhD student will act as the Chair of the Research Committee (RC) for this student. The student’s academic advisor will assist in planning a program that will provide the foundation and background needed in the student's area of intended concentration. The student’s academic advisor will
approve the student's University registration. In some cases, the roles of research advisor and academic advisor will be held by different people. While the academic advisor must be a full-time core faculty member of the Biomedical Engineering Department, the research advisor may be an adjunct member of the faculty. The GC Chair maintains a record of all committee actions and student programs.

(b) The GC operates according to general policies determined by BME faculty vote.

(c) The GC is charged with the evaluation of transfer credits for entering students with previous graduate course work according to the policies described in Section 3.7. Requests should be made using the Graduate School form *Petition for Transfer of Credit*.

2.3 Academic Review
At the end of each semester, the student's record is reviewed by the GC. Candidates with unsatisfactory progress may be placed on academic probation (see Section 9).

3. REQUIREMENTS AND QUALIFICATIONS FOR THE MS AND PhD DEGREES

3.1. Introduction
Applicants to the graduate program are expected to have a degree at the level of Bachelor or Master’s in engineering or basic/applied/health sciences. TOEFL scores (if applicable) are required for admission into the programs.

A student can be accepted either into the MS program or directly into the PhD program. A Master’s degree is not required for a student to apply to the PhD program. A PhD candidate may obtain an MS degree during their study if the requirements for this degree are fulfilled. A student in the MS program who wishes to continue their studies toward the PhD must submit a letter of application to the Department (in which they describe the reasons for switching to the PhD program), an updated resume once they have completed at least one semester of study in the Master’s program, and a letter from the intended PhD advisor to confirm research support. The faculty will then vote on the application and if the vote is positive, the student will be allowed to take the PhD qualifying examination (Section 6). After passing this examination the student should make a formal application to the School of Engineering using the regular application forms and procedures. The application fee is waived and in place of the letters of recommendation, the student must submit their personal and advisor supporting statements.

A student in the MS program who wishes to complete an MS degree with a thesis must identify a potential MS thesis research advisor by the end of their first semester. The student must contact the potential advisor and have the faculty member agree to supervise their MS thesis. During the second semester in the BME program, the student must take the BME MS Project course (BME0299-ORP). In the context of this course, the student will work under the guidance of the research advisor to perform the needed background literature review and prepare an Original Research Proposal focused on the project that will form the basis of the student’s MS thesis. Students pursuing a combined BS/MS degree with thesis need to complete their ORP prior to the start of the fall semester of their MS year of study. The guidelines for preparing such a proposal are described in detail in section 7.
The MS with thesis and PhD programs in the department of Biomedical Engineering are strongly research-oriented, with emphasis on the candidate’s independent research work reflected in their thesis or dissertation. Because Biomedical Engineering is a multidisciplinary field, students are expected to work in collaboration with scientists in diverse fields including engineering, health and life sciences. The required courses consist of foundation courses and elective courses. The purpose of the foundation courses is to provide a broad background in Biomedical Engineering, and to introduce the research activities in the Department. The purpose of the elective courses is to provide in-depth knowledge in specific areas of Biomedical Engineering and to pose a solid basis for students to excel in his/her research work. It is advisable that MS with thesis and PhD students first identify a field of interest and a research advisor, and then select elective courses around the research topic of choice.

Typically, full-time students will take two years to complete the MS with thesis program and four-five years for the PhD program. The MS degree can be completed by exceptionally strong students in two semesters, but in most cases it is expected that requirements will be completed in three semesters. Tufts undergraduate students can enroll in a combined BS/MS program.

Prospective students can obtain more admission information, financial-aid information and application forms at http://gradstudy.tufts.edu.

3.2. Responsibility
A graduate student accepted into one of the graduate programs must satisfy all requirements for that program. To obtain the degree, students must complete the requirements according to the timetable delineated below, unless a written exemption is obtained from the Graduate Committee. Even though a periodic review is made by the Graduate Committee, each student is personally responsible for ensuring that all requirements are fulfilled. At the end of the third (3rd) and fifth (5th) semesters, each student is required to submit a Progress Summary Sheet corresponding to their degree program to their Faculty Advisor and the Department Manager. Copies of these forms are reproduced at the end of this handbook.

3.3. The Foundation Requirement for Graduate Degree Candidates
(a) In order to fulfill this requirement, the student must demonstrate proficiency in the core areas defined by departmental tracks. Proficiency is demonstrated by passing with a minimum grade of B- the foundation courses that are designed to expose the student to the breadth of the field of biomedical engineering:
   1. BME0141: Analytical Tools for Biomedical Engineering;
   2. BME0162: Molecular Biotechnology;
   3. BME0250: Principles of Biomedical Engineering

(b) The foundation course requirement must be fulfilled by the end of the student's second semester in residence or the student may be placed on probation.

(c) Students who do not fulfill the foundation requirement by the end of the third academic semester will not be allowed to continue in the program unless an extension has been approved by the GC.
(d) Students may place out of one (or more) course needed to satisfy the foundation requirement if they demonstrate graduate proficiency in the areas covered in this foundation course by some other means. The way in which proficiency is demonstrated is at the discretion of the faculty member who is responsible for that foundation topic. Students requesting a waiver of foundation course requirements should fill out Form C (see Appendix), get it signed by the foundation course instructor and by the student’s adviser, and return it to the Biomedical Engineering Department Manager. Any foundation course for which the student receives the foundation requirement waiver must be replaced by a graduate level BME elective course.

3.4. Requirements for MS Candidates

a) Courses: MS candidates are required to fulfill 30 semester hour units (SHUs)
   Coursework-only MS degrees: ten (10) courses at the graduate level: two (2) of the courses must be foundation courses; six (6) courses must be BME electives; one (1) course must be a class with a professional development focus - see list, Appendix B; one (1) course may be an elective class with a non-BME designation - advisor approval required, all courses must be completed with a grade of B- or better. At least 24 SHUs must be fulfilled by the end of the third academic semester or the student may be placed on probation and may not be allowed to continue in the program. See section 9 for details.
   MS with thesis: seven (7) courses at the graduate level: two (2) of the courses must be foundation electives; four (4) courses must be BME electives; one (1) course must be BME-02990ORP; three (3) courses will be BME-0295/0296 the BME thesis courses, all courses must be completed with a grade of B- or better. At least 24 SHUs must be fulfilled by the end of the third academic semester or the student may be placed on probation and may not be allowed to continue in the program. See section 9 for details:
   Graduate courses offered in related fields outside the Biomedical Engineering Department must be approved by the GC or the academic advisor.

b) Project: One of the BME elective courses may be fulfilled by the BME ORP Project course (BME-0299-01). The project course is worth three (3) SHUs. The project can be a comprehensive literature study, or a contribution to on-going research activities; theory or design. The project results must be documented in the form of a written report. Students need to identify one of the BME faculty members to pursue a BME project with. The faculty member needs to agree to serve as a BME project supervisor for the student before the student signs up for this course.
   Students wishing to complete a thesis must register for BME0299-ORP and use this course to complete their original research proposal (ORP). (See section 3.5 below)

c) Admission and Continuation: The program accepts students who have a BS or BA degree. Students enrolled in the PhD program in Biomedical Engineering may switch to the MS program with approval of the graduate committee.

3.5. Requirements for MS students completing a thesis.

(a) Original Research Proposal: MS students who wish to complete a thesis are required to identify a BME faculty member who will agree to serve as a research supervisor by the end of the first semester. The student must register for the BME Master’s Project course (BME-
0299-ORP) during the second semester of study and prepare and successfully defend their ORP to enroll in the MS thesis courses BME-0295/0296. If a student fails to defend their ORP successfully, it will be up to the discretion of the research committee members to determine whether the student has performed enough work or needs to do additional work to receive credit for BME-0299-01, so that it can still count as a project course for the MS degree.

(b) Thesis: Students who successfully defend their proposal must enroll in the thesis course (BME-0295/0296) and prepare a thesis, which they defend before their research committee. See Section 8 for details.

c) Scientific publications: MS students who write a thesis should demonstrate the quality of their work and their capability of reporting the results of their research by publishing (or submitting for publication) a minimum of one abstract for a scientific conference, a journal publication, or a patent application.

3.6. Requirements for PhD Candidates

a) Courses: If entering the program with a BS degree, PhD candidates must complete the three (3) foundation courses, five (5) elective courses related to their research area with a minimum grade of B-, and the ORP project course (BME-0299-ORP) for which they register when the PhD dissertation proposal is defended. If entering the program with an MS degree in a related discipline, PhD candidates must complete the three (3) foundation courses, one (1) elective course related to their research area with a minimum grade of B-, and the ORP project course (BME-0299-ORP) for which they register when the PhD dissertation proposal is presented. The course requirements must be fulfilled by the end of the third academic semester or the student may be placed on probation. See section 9 for details. Students who do not fulfill the course requirements by the end of the fourth academic semester may not be allowed to continue in the Ph.D. program. Graduate courses offered in related fields outside the Biomedical Engineering Department must be approved by the GC or the academic advisor.

(b) Teaching and Research Assistantships: Full-time graduate students may be offered teaching or research assistantships as part of their graduate program. These are important educational and pre-professional experiences that also provide some financial support during a student's graduate education. Teaching Assistants (TAs) work with faculty in the delivery of the curriculum in a variety of ways including conducting review sessions, assisting in preparation of course materials, proctoring laboratories, grading and holding office hours to assist students. Research Assistants (RAs) work with individual faculty on projects usually funded by outside agencies. These appointments may be held any time during the calendar year. Graduate students may hold concurrent, hybrid RA/TA appointments as long as their assistantship duties and stipend levels conform to the general guidelines. Because of the educational value of a teaching experience, PhD candidates are required to serve in a teaching capacity (such as TA or an equivalent alternative) for at least two semesters.

c) Graduate Seminars: PhD candidates are required to register for the Graduate Seminar course (BME-0291/0292) every semester. Students who miss more than three seminars per semester will receive a grade of unsatisfactory. A student receiving two unsatisfactory BME seminar grades may be placed on probation. When taken for credit, students will present a seminar and
earn 1 SHU per semester taken. During the course of study, at least four, 1 SHU seminar presentations are required.

Community Outreach: The BME Department is committed to enabling its students to establish a perspective on their responsibilities to promote the development of a diverse, equitable, and inclusive community of scientists and engineers. In the context of their enrollment in the BME seminar course (BME-0291/0292), students will participate in seminars and discussions that cover a range of topics that promote learning and awareness in topics such as racial justice, diversity, bias, and potential approaches to eliminate them from our society. As part of this course, students are also required to participate in at least one outreach activity per year aiming to encourage and enhance participation in the sciences and engineering by a diverse population of students. The activity should require a commitment of at least one hour (not including travel time). The course coordinator will provide a list of activities for the students to participate in at the beginning of each semester. Students will also be allowed to participate in independent activities as long as relevance and time commitment can be verified and approved by the course coordinator. 1 SHU will be granted during the semester the activity is completed. A total of 2 SHUs attributed to these activities needs to be accumulated during the first two years in the PhD program. Additional time and participation in such activities is strongly encouraged throughout a student’s tenure in our PhD program.

(d) Critical paper review, research proposal, and dissertation: PhD candidates must prepare a critical analysis of a scientific article, an original research proposal and a dissertation to be presented before their Research Committee. See Sections 6, 7 and 8 for details.

(e) Scientific Publications: PhD candidates must demonstrate the quality of their work and their capability of reporting the results of their research by publishing a minimum of three scientific articles as first author. At least two of these articles must be published in peer-reviewed scientific journals, while a third publication may be a full-length conference proceedings paper.

(f) Summary of credit requirements: A total of 90 SHUs is required for a PhD with prior BS degree; a total of 78 SHUs is required for a PhD with prior Master’s degree. The credit requirements are outlined as follows:

With Prior B.S. Degree:
1. Three (3) foundation courses (9 SHUs)
2. Five (5) graduate elective courses (at least 15 SHUs)
3. Original Research Proposal course (BME-0299-ORP) taken when thesis proposal is prepared and defended (3 SHUs)
4. Attend Graduate Seminars every semester enrolled in PhD program, present a unique seminar and/or technical talk for 4 semesters (4 SHUs), and participate in outreach activities for two semesters (2 SHUs)
5. BME dissertation, BME-0297/0298, credits (up to 57 SHUs)*

Total = 90 SHUs for PhD without prior MS

*Once the student has fulfilled all dissertation SHU requirements, they should enroll in BME-0502-FT to maintain full-time status, or BME-0501-PT if part time.
With Prior Relevant Graduate Degree:
1. Three (3) foundation courses (9 SHUs)
2. One (1) graduate elective course (at least 3 SHUs)
3. Original Research Proposal course (BME-0299-ORP) taken when thesis proposal is prepared and defended (3 SHUs credit)
4. Attend Graduate Seminars every semester enrolled in PhD program, present a unique seminar and/or technical talk for 4 semesters (4 SHUs), and participate in outreach activities for two semesters (2 SHUs)
5. BME dissertation, BME-0297/0298, credits (up to 59 SHUs)*

Total = 80 SHUs for PhD with prior relevant graduate degree
*Once the student has fulfilled all dissertation SHU requirements, they should enroll in BME-0502-FT to maintain full-time status, or BME-0501-PT if part time.

3.7. Graduate Committee Policies for Transfer of Graduate Course Credit
(a) Graduate courses taken prior to enrollment in the Biomedical Engineering graduate program (taken at Tufts or elsewhere) may, under certain circumstances, be transferred and counted towards a Tufts University Biomedical graduate degree. Students wishing to transfer a course should file a written petition (attached Form D) with the GC. For a course to be eligible for transfer, the student must have earned a minimum grade of B- in that course.

(b) No more than two of the total required courses may be transferred from another institution for MS or PhD candidates. An additional two graduate courses may be transferred if taken at Tufts. Four courses, if taken as part of a Tufts Certificate program, may be transferred if relevant to the program of study.

(c) Courses transferred must not have been counted toward a previously conferred baccalaureate or advanced degree.

(d) Students should consult the Student Services Center’s "Graduate Student Handbook" prior to submitting Form D to the GC.

3.8. Petition to receive an MS degree when enrolled in the PhD program
Students accepted and enrolled in the PhD program can petition to receive an MS non-thesis degree upon completion of the following requirements:
1. Three (3) foundation courses (9 SHUs)
2. Five (5) graduate elective courses (at least 15 SHUs)
3. Successful presentation of their PhD Original Research Proposal (BME-0299-ORP = 3 SHUs)
4. Attend Graduate Seminars every semester enrolled in program, and participate as presenter for two semesters; participate in one community outreach activities (3 SHUs)

Total = 30 SHUs for MS degree for students in the PhD program
Students are responsible for filing the appropriate documentation with the School of Engineering Graduate Studies Office so that they can receive this MS degree upon completion of these requirements.
4. RESEARCH ADVISOR (MS with thesis and PhD Candidates)
4.1. Selection of the Research Advisor
(a) The research advisor is the faculty member with whom the student chooses to collaborate on their thesis or dissertation research project. Most often, the student selects a subject from among several that the professor may suggest as appropriate for the MS thesis or the PhD dissertation. The student is expected to contribute to the direction of the work as the research progresses.

(b) New students are strongly encouraged to inform themselves about the research interests of the faculty by reading background material, requesting reprints for in-depth study, and especially by visiting those professors and their graduate students whose work appears to be of greatest interest. These visits are the occasion for detailed discussions of the research the student might undertake for the degree.

(c) When the student is ready to select a research advisor, an appointment should be made with the professor to discuss arrangements. The professor and the student should discuss the initial research topic on which the student will begin, the sources of financial support during the academic year and summer, and course work or other requirements the professor feels are essential to the proposed research.

(d) Students should select a research advisor by the end of their first semester. The selection should be done thoughtfully, as student and research advisor normally work together very closely, and each has a vital interest in the progress of their collaboration.

(e) In most cases the research advisor also acts as the student’s academic advisor. If the research advisor is not a full-time BME faculty member, then the student must also have an academic advisor who is a full-time BME faculty member.

5. RESEARCH COMMITTEE (MS with thesis and PhD Candidates)
5.1. Selection and Purpose
(a) When the student is ready to begin reporting the results of the research, or after passing the Critical Review examination (Section 6 below) the student and research advisor meet to choose a formal research committee. The PhD committee is composed of at least four members: the research advisor, at least one other biomedical engineering faculty, one additional member outside the department, and one member from outside the University. The MS committee is composed of at least three members: the research advisor, at least one other biomedical engineering faculty, and one additional member outside the department.

(b) The research committee is charged with the following duties:
   (i) Continue the academic advising function;
   (ii) Evaluate the written & oral defense of the original research proposal (PhD candidates);
   (iii) Evaluate the student’s progress and training goals;
   (iv) Evaluate the candidate’s scientific publications;
   (v) Evaluate the written & oral defense of the student's thesis/dissertation research.
5.2. Periodic Evaluation
The research committee of PhD dissertation candidates will meet at least once a year, with the first meeting taking place no later than the end of the fall semester of the fourth year. The Dissertation Advisory Committee (DAC) Evaluation form (Appendix Form D) and the Training and Career Goals Progress Report (TCGPR) (Appendix Form E) should be submitted to the Department Manager at the end of the evaluation meeting. It is the student’s responsibility to make arrangements for this meeting in a timely fashion and to submit drafts of the Dissertation Advisory Committee report, DAC Evaluation form (progress sections to be filled by STUDENT only), and the TCGRP at least one week prior to the meeting to allow the committee members time for review.

During the meeting, the student should plan to provide an overview of progress and research/career plans, which should last no more than 30 minutes. This should be followed by discussion with all committee members present. Then, a brief session between the student and committee members without the advisor will follow. Finally, all committee members will reconvene to finalize and sign the DAC Evaluation Form. The student may be placed on probation if they fail to schedule these meetings in the recommended timeline.

5.3. Dissertation Committee Report
Your dissertation committee report should be approximately 2-2.5 pages long and include the following sections:

a) Specific Aims - Briefly state the main aims of the project and note any changes from the last meeting or ORP. If there are changes, provide brief justification. This section should be no more than ½ a page.
b) Significance - Briefly state the significance of the project, noting especially any new key relevant findings, especially from other groups. Length should be a paragraph, no more than ½ a page.
c) Progress - Highlight: i) key results and their significance; ii) key obstacles and brief description of strategy for addressing them. Length should be 1/5 page maximum. Key figures should be included.

6. CRITICAL ANALYSIS OF A SCIENTIFIC ARTICLE (PhD Candidates)
6.1. Purpose
Critical thinking, quantitative analysis capabilities, and depth of technical knowledge shall be demonstrated by successfully completing a written and oral review of a published scientific article. Research scientists and engineers are often called upon to give an oral presentation of research work or technical achievements, and are required to critically evaluate the state of the art. Hence, it is necessary to learn how to read the scientific literature, perform quantitative and critical analyses, and present effective summaries both orally and in writing.

6.2. Content
The exam consists of a critical review and analysis of a technical paper taken from the literature to be presented to the department faculty. The exam outcome will be based on three parts:
(a) A written review of the technical paper 5 to 10 single spaced pages in length excluding references, 12pt font with one-inch margins;
(b) An oral report;
(c) A question/answer session
The student will have the choice of one of a set of papers which will be made available *three weeks* before the examination. The written review must be delivered to the department faculty *no later than two business days* before the time of the examination.

Students should be prepared to give a 15 minute presentation of their analysis of the assigned paper and to allow 60 minutes to answer questions on the paper analysis and on any basic concepts, experimental techniques, instrumentation technology, theoretical models, and methods of data analysis that are relevant to the paper.

6.3. Guidelines for Preparing and Presenting the Written Review

(a) Written Report
The following are suggested guidelines for the critique of the assigned paper. Note that these guidelines are not intended as detailed or specific instructions on how to prepare your presentation. Instead, they suggest the scope of your analysis. At a minimum, your critique should contain the following two elements:

1. *Technical analysis:* Determine whether the contents of the paper are technically sound. For example, are there any logical flaws? Are the assumptions correctly stated and justified? How crude or sophisticated is the analysis and is the approach appropriate? Are the conclusions supported by the data presented?

2. *Context:* Without reiterating the contents of the paper, identify the key contribution(s) of the paper and evaluate whether these are significant. You should identify and state the nature of the contribution. For example, does the paper present a new method of analysis? Does it present new data? Resolve a conflict in the literature? Do the results of the paper lead to new research questions? If so, what are they? Most importantly, be ready to defend your judgment based on your knowledge and scientific reasoning. Please note that your presentation should not be just a summary of the article, but should take the article as a starting point for a critical assessment of the article.

The written review should contain just enough technical background to inform a scientist or engineer who is not an expert in the topic of the paper of the theoretical and experimental basis of the methods and analytical tools by the paper. The review should be scientifically accurate and fully referenced. The written report should be aimed at a specialist readership and should be similar in style to a review article. The written report should represent the best effort of the student to present his/her own ideas in a clearly written, error-free document.

Since the exam is based on a common set of papers, **every student must work independently.**

(b) Oral Report and Examination
The oral presentation must reflect a graduate-level understanding of the paper and be appropriately detailed. The presentation should be aimed at a biomedical-engineering-educated general audience, not a lay audience. The student must demonstrate a thorough knowledge of the subject material in response to questions from the examination committee.

Responses to questions must be lucid. Questions may cover any aspect of the paper, including general principles, basic technology, and scientific methods related to the paper selected and
the written report. Related questions will also address topics covered in any courses taken by the student during his/her academic tenure in the Department.

The student must display a familiarity with the relevant theoretical, experimental, or computational methods reported in the paper. Well-established and latest models/mechanisms related to the subject of the paper should be reviewed and described at a sound technical/scientific level in both the written and oral communications. In particular, the oral component of the examination will be aimed at understanding the depth of the student's knowledge of the experimental methods and theoretical principles that form the basis of the paper presented, and his/her critical thinking skills.

6.4. Evaluation
Once all students have completed their qualifying exam, the faculty will convene and discuss the results of the examination. The students will be formally notified of the outcome of the examination by the next business day after the exam. The committee will evaluate the student’s performance using the criteria detailed above.

6.5. Completion Date
These examinations are generally given in Spring (late May or early June) and in Fall (mid-September). Students must attempt the Spring examination immediately following their first academic year.

If the student fails, they may retake the exam in the Fall of the same year. If the student fails the second examination, they will be dismissed from the PhD program, and may be allowed to complete the coursework MS or MS with thesis program. In extraordinary cases, additional assignments can be considered to allay the concerns of the examination committee.

7. ORIGINAL RESEARCH PROPOSAL (MS with thesis and PhD Candidates)
7.1. Definition and Purpose
The research proposal is, in part, an assessment of the student’s ability to frame hypotheses and identify questions of scientific importance. The research proposal should be based on the student's own research. It provides the opportunity to demonstrate both understanding and originality. The original proposal consists of a written document, an oral presentation, and defense before the research committee (PhD candidates) or BME faculty (MS with thesis).

7.2. Role of Research Committee
As described in Section 5, the student's research committee will advise on the preparation of the proposal and is charged with evaluating it as sufficient to satisfy this portion of the degree requirement.

7.3. Guidelines for Preparing the Original Proposal
The student must meet these guidelines in order to complete successfully the research proposal requirement.

   A. Written Proposal
      A modified NIH format as described below should be used, but the specific aims should be limited to one. The complete proposal should be 8-10 pages maximum (single-spaced,
not including references). The student must be certain to document evidence and statements fully in the references. Citations should include all authors and full title of the article in each reference, following a consistent set of bibliographic conventions, preferably those used by a leading journal in the area of the proposal. Reviewers often consider brevity and clarity in the presentation to be indicative of a focused approach to a research objective and the ability to achieve the specific aim of the project. Therefore, proposals should include sufficient, but concise, information to facilitate an effective evaluation without having to review other material.

Organize items 1-4 below in the NIH format, to answer these questions: (a) Why is the work important? (b) What has already been done? (c) What do you intend to do and how would this extend current knowledge in the field? (d) How are you going to do the work? Do not exceed 10 pages for items 1-4. All tables and graphs must be included within the 10-page limit of items 1-4.

1. **Specific Aim (1/2 page)**
   List the broad, long-term objectives and describe concisely and realistically what the specific aim described in this proposal is intended to accomplish and the hypothesis to be tested. Briefly summarize experiments which will be proposed to investigate the specific aim. The statement of the problem must be precise and unambiguous. There should be no room for doubt as to what is meant.

2. **Introduction (Background and Significance) (2-3 pages)**
   Emphasize the importance and context of the proposal. Briefly sketch the background to the proposal, critically evaluate existing knowledge, and specifically identify the gaps which the project is intended to fill. State concisely the importance of the research by relating the specific aim to the broad long-term objectives.

3. **Research Design (5-6 pages)**
   Describe the research design and the procedures to be used to accomplish the specific aim of the project. The approach to the research should be described fully, including the feasibility of each step in the process proposed for solving the problem. Include the means by which the data will be collected, analyzed, and interpreted. Do not emphasize details such as recipes for buffered solutions. Describe any new methodology and its advantage over existing methodologies. The probable results of the proposed research and the conclusions which would follow from each, should be fully described. Discuss the assumptions, potential difficulties, and limitations of the proposed procedures and alternatives approaches to achieve the aims. Provide a tentative timetable for the investigation. Substantial costs for equipment, computer time, and materials, should also be estimated.

4. **Discussion and Future Directions (1/2 page)**
   Describe how the results obtained from this proposal can be interpreted and how they will contribute to the overall knowledge in the area and influence future investigations.
B. Oral Presentation and Examination
The student should be prepared to give a 20-25 minute oral presentation of the research proposal. The student should feel free to prepare additional explanatory materials about the proposal, which may be used during the exam. The examination itself will be directed at the exploration of the theoretical and practical basis of the research proposal, as well as its rationale.

C. General
1. The student is encouraged to consult with his or her research advisor in formulating the basis of the proposal since it will likely lay the groundwork for subsequent dissertation research. However, the proposal as a whole is to be developed mainly by the student, and all writing should be done by the student. Faculty or other students may provide assistance with specific technical problems and will be accessible to the student to address specific questions. Review of the written material by other students and postdoctoral fellows is permitted and encouraged to facilitate the production of a clear, concise and grammatically correct document.
2. If advice is needed as to whether a problem is suitable as a basis for a proposal, a meeting should be scheduled with the research committee to discuss these matters.
3. A copy of the written proposal should be given to each member of the research committee at least one week before its presentation/defense.

7.4. Completion Date
MS students who wish to pursue an MS with thesis degree must complete the original research proposal before the end of their second (2nd) semester. PhD students must complete the original research proposal before the end of the fifth (5th) semester. Students originally accepted in the MS program who have switched to the PhD program, must complete the original research proposal within three (3) semesters from the time they passed their qualifying exam. If an MS student had an ORP for their MS thesis, the ORP will need to be repeated for the PhD dissertation within three (3) semesters from the time they passed the qualifying exam. PhD students failing to complete this requirement may be placed on academic probation for one semester. At the end of the probationary semester the student may be dismissed from the PhD program if the requirement remains unsatisfied.

7.5. Evaluation
(a) At the proposal defense, the committee will discuss the proposal by probing the areas emphasized above. If appropriate, related aspects of the proposal may also be discussed. The proposal will be judged on the basis of novelty of the research idea and the suitability of the proposed approach. The objective is to assess the independent research ability of the student at this stage of the MS or PhD degree work.

(b) The committee will deliberate in private at the conclusion of the defense and immediately inform the student of their decision. If the MS student fails, they will not be able to pursue an MS with thesis; rather, the student will continue in the coursework-only MS program. If the PhD student fails, the student will be placed on probation and must reschedule a new examination no later than the following semester. If the student fails the second examination, they will be dismissed from the PhD program. Upon approval of the research proposal by the
research committee, the student must file Form A (Appendix) with the GC Chair and submit to the BME Department Manager.

8. THESIS AND FINAL ORAL DEFENSE (MS with thesis and PhD Candidates)

8.1. Requirements
The "Graduate Student Handbook" specifies the thesis regulations, which have been set forth by the Graduate School of Arts and Sciences and the School of Engineering. Additional requirements for the thesis and dissertation are the responsibility of the research advisor. The Biomedical Engineering Department requires, as part of the procedure by which a thesis is approved, a formal oral defense by the candidate before an examination committee. This committee recommends action to the University regarding the thesis/dissertation. The Chair of the Biomedical Engineering Department certifies completion of the degree requirements and recommends to the Dean of the School of Engineering that the degree be awarded.

8.2. Selection and Composition of the Examination Committee
(a) The MS examination committee consists of at least two members of the Biomedical Engineering Department. One additional member from outside the Department will be part of the MS examination committee. The PhD examination committee consists of at least two members of the Biomedical Engineering Department, one additional member from outside the Department and one member from outside the University. Ordinarily, the members of the student's research committee serve as the Examination Committee. For the sake of maintaining the continuity of the committee, faculty members who have left the department during the year preceding the thesis defense may be considered as either Department or outside committee members.

(b) Copies of the thesis or dissertation must be delivered to the examination committee at least TWO (2) weeks prior to the examination.

(c) The student, in consultation with the Chair of the Examination Committee, arranges the time and place and notifies the Department Chair at least TEN days in advance. MS examinations must be announced to the faculty of the Department, and PhD examinations to the faculty of the University in the form of written announcements including the information listed below. A copy of the notice is also put into the student's file.
   (i) Name of Student;
   (ii) Name of Department (Biomedical Engineering);
   (iii) Degree;
   (iv) Title of Thesis/Dissertation;
   (v) 250 word abstract
   (vi) Names of Examining Committee Members, Chair, and Research Advisor;
   (vii) Time and Place of Examination
8.3. Presentation and Defense
As part of the MS and PhD requirements, the student is required to make a public presentation of the thesis/dissertation work, which is to be followed by a private oral defense in front of the Examination Committee.

8.4. Possible actions of the Examination Committee
(a) *Acceptance of dissertation/thesis.*
(b) *Acceptance with minor changes.* This action requires the candidate to incorporate the minor changes, but allows for the signatures of all committee members at the conclusion of the defense with no further re-examination necessary.
(c) *Acceptance with major changes.* This action requires a re-examination of the corrected thesis by the committee, but no repetition of the oral examination.
(d) *Rejection.* This action requires the student to prepare a new thesis, and generally involves additional research work. The Examination Committee will address a brief memorandum apprising the Department and GC Chairs of the situation.

9. ACADEMIC PROBATION
9.1. Conditions Leading to Probation
Academic probation is a formal status a graduate student assumes when they have not met the requirements to remain in the program. Some reasons for a student being subject to probation include:
(a) Significant number of courses below a B-;
(b) Failure to meet deadlines or fulfill requirements stipulated by the student's research advisor or research committee;
(c) Unsatisfied Foundation Requirement at the beginning of the second semester in residence;
(d) Course requirements not met after three semesters;
(e) Critical analysis of scientific article not completed after three semesters (PhD only);
(f) Original proposal not completed after 3 semesters from the time the qualifying exam is taken (PhD only).

9.2. Rectification
A student on probation has one semester to rectify the deficiency. Academic probation can only be removed by the Graduate Committee.

9.3. Consequences
If not rectified by the end of the probationary semester, the student may face dismissal from the graduate program. Such PhD candidates may receive an MS degree if they have completed the requirements for that degree at the end of their probationary semester. Students on probation may become ineligible to receive a teaching or research assistantship or other financial assistance including federal aid.
10. TEACHING ASSISTANT GUIDELINES

10.1. Assignment
A Teaching Assistant (TA) is assigned to a course by the Department in consultation with the Graduate Committee and Department Chair. Individual requests may be made well in advance of each semester; however, the final decision rests with the Department Chair.

10.2. Responsibilities
Teaching Assistants' (TAs) work with faculty in the delivery of the curriculum in a variety of ways including, but not limited to conducting review sessions, assisting in preparation of course materials, proctoring laboratories, grading and holding office hours to assist students.

The course supervisor assigns all course-related work to the TA. Failure to fulfill the teaching responsibilities as delineated by the course supervisor may be cause for dismissal as a teaching assistant. This may include not only loss of stipend but also loss of guaranteed support and tuition waiver.

10.3. Conflict of Interest
(a) Since the TA is in a position of authority, any romantic involvement while the student/teacher relationship exists (even if consensual) must be avoided. In addition to being in violation of University policy, such relationships may lead to de-facto sexual harassment and prompt disciplinary action.

(b) In a situation where a student and a TA are more than casual acquaintances, the TA should request that the student be switched to another section in order to avoid any real or apparent conflict of interest.

(c) Since the TA is being paid by the Department to teach their students, it is improper for a TA to tutor for profit any student for whom the TA has official grading or tutoring responsibility.

11. ETHICAL CONDUCT
All members of the Biomedical Engineering Department are required to maintain the highest of ethical standards in all of their research and teaching duties. Two documents which should be consulted are the Tufts University Handbook "Academic Integrity" published by the Dean of Students Office and "On Being A Scientist - Responsible Conduct in Research" published by the National Academy Press.
12. APPENDICES
Appendix A - Examples of degree programs
Appendix B - Professional Development Courses
The following forms are contained at the end of the handbook for your use:
  • Progress Summary Sheet for PhD Candidates
  • Form B - Satisfactory Completion of Original Research Proposal
  • Form C - Department Pre-Approval Form for Transfer of Credit Petition
  • Form D - Form for waiver of foundation course requirement

NOTE: Upon completion of the requirement, the respective form must be completed by the student, signed by all the research committee members, and then submitted to the Chair of the Graduate Committee.

The instructions to apply for graduation can be found at: https://students.tufts.edu/registrar/what-we-assist/apply-graduation

The form to Request a Leave of Absence can be found at: https://students.tufts.edu/student-affairs/health-wellness-and-safety/leaves-absence

The form to Request Transfer of Credit can be found at: https://students.tufts.edu/registrar/what-we-assist/transfer-credit/graduate-students

A full listing of similar forms can be found at: https://students.tufts.edu/registrar/student-forms

The School of Engineering and the Graduate School of Arts and Sciences forms should be completed by the student and submitted to the Graduate Committee Chair. The forms will then be returned to the student who should forward them to the Graduate School.
APPENDIX A: Examples of degree programs

Example of MS Degree in Biomedical Engineering:
Two graduate foundation courses (6 SHUs)
  - Principles of Biomedical Engineering (BME-0250)
  - Molecular Biotechnology (BME-0162)
One professional development course from list in Appendix B (3 SHUs)
Graduate level elective courses (21 SHUs)
  - BME-0100 Design of Medical Instrumentation
  - BME-0215 Optics and Wave Motion
  - BME-0131 Principles of Medical Imaging
  - BME-0251 Graduate Introduction to Biophotonics
  - BME-0153 Biomaterials and Regenerative Medicine
  - BME-0154 Tissue Engineering and Regenerative Medicine
  - BME-0256 Quantitative Biomaterials Characterization Laboratory

Example of MS Program in Biomedical Engineering with a thesis (focus on Biomedical Optics):
Two graduate foundation courses (6 SHUs)
  - Principles of Biomedical Engineering (BME-0250)
  - Molecular Biotechnology (BME-0162)
Graduate level elective courses (12 SHUs)
  - BME-0100 Design of Medical Instrumentation
  - BME-0215 Optics and Wave Motion
  - BME-0256 Graduate Quantitative Biomaterials Characterization Laboratory
  - BME-0251 Graduate Introduction to Biophotonics
BME-0299-ORP MS Project (taken during the second semester when the ORP is defended) (3 SHUs)
Participation in research mentoring team
Thesis (9 SHUs)

Example of PhD Program in Biomedical Engineering (with prior BS degree, focus on Biomedical Optics):
Three graduate foundation courses (9 SHUs)
  - Principles of Biomedical Engineering (BME-0250)
  - Molecular Biotechnology (BME-0162)
  - Analytical Tools for Biomedical Engineering (BME-0141)
Graduate level elective courses: (15 SHUs)
  - BME-0215 Optics and Wave Motion
  - BME-0131 Principles of Medical Imaging
  - BME-0251 Graduate Introduction to Biophotonics
  - BME-0153 Biomaterials and Regenerative Medicine
  - BME-0256 Graduate Quantitative Biomaterials Characterization Laboratory
BME-0299-ORP (taken during the semester the thesis proposal is submitted and defended) (3 SHUs)
BME-0291 (x2), BME-0292 (x2) Graduate Seminar (4 SHUs)
Participation in research mentoring team
Dissertation (59 SHUs)
Examples of MS Program with a thesis (focus on Regenerative Medicine):

Two graduate foundation courses (6 SHUs)
  o Principles of Biomedical Engineering (BME-0250)
  o Molecular Biotechnology (BME-0162)

Graduate level elective courses (12 SHUs)
  o BME-0121 Quantitative Physiology I
  o BME-0121 0163 or 0168 Recombinant DNA Techniques or Biotech. Processing Projects Lab
  o BME-0153 Biomaterials and Regenerative Medicine
  o BME-0175 Tissue Engineering Research Laboratory

BME-0299-ORP (taken during the second semester when the thesis proposal is defended) (3 SHUs)

Participation in research mentoring team

Thesis (9 SHUs)

Examples of PhD Program (with prior BS degree, focus on Regenerative Medicine):

Three graduate foundation courses (9 SHUs)
  o Principles of Biomedical Engineering (BME-0250)
  o Molecular Biotechnology (BME-0162)
  o Analytical Tools for Biomedical Engineering (BME-0141)

Graduate level elective courses (15 SHUs)
  o BME-0121 Quantitative Physiology I
  o BME-0121 Recombinant DNA Techniques
  o BME-0153 Biomaterials and Regenerative Medicine
  o BME-0168 Biotechnology Processing Projects Laboratory
  o BME-0169 Seminar in Biotechnology

BME-02990ORP (taken during the semester the thesis proposal is submitted and defended) (3 SHUs)

BME-0291 (x2), BME-0292 (x2) Graduate Seminar (4 SHUs)

Participation in research mentoring team

Dissertation (59 SHUs)
APPENDIX B: Professional Development Courses

Professional Education classes available from the Tufts Gordon Institute that may satisfy professional development course requirement for students pursuing an MS non-thesis degree (total 3 SHUs)

- **EM0211** – Lean Six Sigma (with option to earn lean six sigma black belt certification)
- **EM0231** – Project Management Strategies & Methodologies
- **EM0241** – Strategic Management in the Era of Big Data Analytics
- **EM0262** – Negotiation & Conflict Resolution for Engineers & Technologists
- **EM0254** – Advancing Innovation: Breakthrough Methodologies for Technology Firms
- **EM0261** – Leadership for Technical Professionals
## Progress Summary Sheet (MS Candidates - Coursework-Only Degrees)

Name______________________________________      Semester Enrolled__________________

Academic Advisor___________________________________________

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Deadline</th>
<th>Course</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation Courses (2 courses)</td>
<td>End of 2nd academic semester</td>
<td>BME-0141, Analytical Tools for BME</td>
<td>☐ __________</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BME-0162, Molecular Biotechnology</td>
<td>☐ __________</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BME-0250, Principles of BME</td>
<td>☐ __________</td>
</tr>
<tr>
<td>Graduate Course Work (7 courses)</td>
<td>End of 2nd or 3rd academic semester</td>
<td>1. BME-________________________</td>
<td>☐ __________</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. BME-________________________</td>
<td>☐ __________</td>
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<tr>
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<td>3. BME-________________________</td>
<td>☐ __________</td>
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<td>4. BME-________________________</td>
<td>☐ __________</td>
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<td>5. BME-________________________</td>
<td>☐ __________</td>
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<td></td>
<td>6. BME-________________________</td>
<td>☐ __________</td>
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<tr>
<td></td>
<td></td>
<td>7. BME-________________________</td>
<td>☐ __________</td>
</tr>
<tr>
<td>Professional Development (1 course)</td>
<td>End of 2nd or 3rd academic semester</td>
<td>1. EM-________________________</td>
<td>☐ __________</td>
</tr>
</tbody>
</table>
**Progress Summary Sheet (MS Candidates - Thesis Degrees)**

Name______________________________________      Semester Enrolled__________________

Academic Advisor___________________________________________

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Deadline</th>
<th>Course</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation Courses</td>
<td>End of 2nd academic semester</td>
<td>BME-0141, Analytical Tools for BME</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BME-0162, Molecular Biotechnology</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BME-0250, Principles of BME</td>
<td></td>
</tr>
<tr>
<td>Research Committee &amp; Advisor identified</td>
<td>End of 1st academic semester</td>
<td>Thesis Advisor: ___________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Committee 1: ___________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Committee 2:</td>
<td></td>
</tr>
<tr>
<td>Graduate Course Work</td>
<td>End of 3rd academic semester</td>
<td>1. BME-________________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. BME-________________________________</td>
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<td></td>
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<td>3. BME-________________________________</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>4. BME-________________________________</td>
<td></td>
</tr>
<tr>
<td>Original Research Proposal</td>
<td>End of 2nd academic semester</td>
<td>BME-0299, Original Research Proposal</td>
<td></td>
</tr>
<tr>
<td>(1 course)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific Publication</td>
<td>Any time before thesis presentation</td>
<td>Title:</td>
<td></td>
</tr>
<tr>
<td>Written Thesis</td>
<td>2 weeks prior to oral presentation</td>
<td>Copy submitted to 3 thesis committee members</td>
<td></td>
</tr>
<tr>
<td>Thesis Presentation</td>
<td>Title:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Progress Summary Sheet (PhD Candidates)

**Name______________________________________**  
**Semester Enrolled__________________**

**Academic Advisor___________________________________________**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Deadline</th>
<th>Course</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundation Courses</strong> (3 courses)</td>
<td>End of 2\textsuperscript{nd} academic semester</td>
<td>BME-0141, Analytical Tools for BME</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BME-0162, Molecular Biotechnology</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BME-0250, Principles of BME</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substitute - ____________________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substitute - ____________________________________</td>
<td></td>
</tr>
<tr>
<td><strong>Critical Analysis of Article</strong></td>
<td>End of 2\textsuperscript{nd} academic semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Research Committee Advisor identified</strong></td>
<td>After completion of Critical Analysis of article</td>
<td>Research Advisor _______________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Committee 1: ___________________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Committee 2: ___________________________________</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Committee 3: ___________________________________</td>
<td></td>
</tr>
<tr>
<td><strong>Graduate Course Work</strong> (Prior MS degree + 1 course) (Prior BS degree + 5 courses)</td>
<td>End of 3\textsuperscript{rd} academic semester</td>
<td>1. BME- _________________________________________</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2. BME- _________________________________________</td>
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<td>3. BME- _________________________________________</td>
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<td>4. BME- _________________________________________</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>5. BME- _________________________________________</td>
<td></td>
</tr>
<tr>
<td><strong>Original Research Proposal</strong> (1 course)</td>
<td>End of 5\textsuperscript{th} academic semester</td>
<td>BME-0299, Original Research Proposal</td>
<td></td>
</tr>
<tr>
<td><strong>Teaching</strong></td>
<td>Any time before dissertation defense</td>
<td>BME-0405-TA, Teaching Assistantship</td>
<td></td>
</tr>
<tr>
<td><strong>Scientific Publications</strong></td>
<td>Any time before dissertation defense</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Written Dissertation</strong></td>
<td>2 weeks prior to oral defense</td>
<td>Copy submitted to all 4 members of examination committee</td>
<td></td>
</tr>
<tr>
<td><strong>Dissertation Defense</strong></td>
<td></td>
<td>Title: __________________________________________</td>
<td></td>
</tr>
</tbody>
</table>
This page intentionally left blank
Form A has been eliminated
FORM B

Satisfactory Completion of Original Research Proposal

________________________________________ ( )

Student Name                ID Number

has satisfactorily completed the written and orally presented original proposal on

_________________________ entitled:

Date

_____________________________________________________________________________________________

_____________________________________________________________________________________________

_____________________________________________________________________________________________

Research Committee Signatures:

________________________________________________________________

Research Advisor

________________________________________________________________

Committee Member

________________________________________________________________

Committee Member

________________________________________________________________

Committee Member

After satisfactory completion of the original research proposal presentation and oral exam, this form must be completed by the student and returned to the Biomedical Engineering Department Manager.
## FORM C

**Department Pre-Approval Form for Transfer of Credit Petition**

Please fill out the top part of this form and then file it with any member of the GC. The course syllabus and description, as well as a completed [Tufts Graduate School Transfer of Credit Form](#) submitted through SIS must accompany this form. Please use a separate Form D for each course.

### To be filled out by student:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Today’s date:</td>
<td></td>
</tr>
<tr>
<td>Student Name:</td>
<td></td>
</tr>
<tr>
<td>Student ID#:</td>
<td></td>
</tr>
<tr>
<td>Course number and title:</td>
<td></td>
</tr>
<tr>
<td>Date course taken (semester/year):</td>
<td></td>
</tr>
<tr>
<td>Where course was taken:</td>
<td></td>
</tr>
</tbody>
</table>

### For Tufts GC use:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tufts equivalent course (if any):</td>
<td></td>
</tr>
<tr>
<td>□ This course satisfies the Core Requirement in:</td>
<td></td>
</tr>
<tr>
<td>□ This course does not satisfy a Core Requirement but may be counted toward the Course Requirement.</td>
<td></td>
</tr>
<tr>
<td>□ This course may not be used toward an advanced degree in Biomedical Engineering at Tufts.</td>
<td></td>
</tr>
</tbody>
</table>

Signature of Tufts Instructor: ________________________________
(if applicable)

Signature of GC Representative: ________________________________

Signature of Department Chair: ________________________________
FORM D

Waiver of BME Graduate Foundation Course Requirement

__________________________________________
Date

The requirement of foundation course: ________________________________________________

Course # and Title

has been waived for ________________________________________________________________

Student Name                  ID Number

Reasoning:

☐ This course or equivalent has been taken previously by the student
☐ Other (specify below)

_____________________________________________________________________________________________
_____________________________________________________________________________________________
_____________________________________________________________________________________________

The replacement course is: __________________________________________________________

Course # and Title

Required Signatures:

__________________________________________________________________
Foundation Course Instructor

__________________________________________________________________
Academic Advisor

This form must be completed by the student and returned to the Biomedical Engineering Department Manager.