Biomedical Engineering (BME) Ph.D. Qualifying Examination Policy

The combined Ph.D. Preliminary/Qualifying Examination in BME consists of a written research proposal followed by an oral examination. Specific requirements are as follows.

1. Grade point average
   A student must have at least a 3.3 coursework GPA in order to take the Qualifying Examination.

2. Dissertation topic
   The student and the Ph.D. thesis advisor shall agree upon an original research project of mutual interest that is appropriate in scope for a doctoral dissertation. Such a project must investigate multiple independent but related scientific questions. That is, there must be at least two Specific Aims and it should be possible to investigate each Aim independently without relying on the results of other Aim(s). The scope of each Specific Aim should be similar to that of a peer-reviewed journal article.

3. Proposal format
   The student shall prepare a written research proposal on the dissertation topic, organized as follows.
   - Title page
   - Background and Significance—Background should include a focused summary of relevant prior work in field, including from same laboratory, on which project builds and should lay the foundation for the proposed project; Significance should convey the importance of the student’s planned, original contribution to field
   - Specific Aims (two pages, maximum)—Problem statement and hypotheses/objectives
   - Research Plan—Experimental design, detailed protocol and analysis methods and consideration of potential problems and alternative approaches.
   - Preliminary Results (optional)—Student’s own work toward aims of project
   - Expected Impact
   - References
   - CV

   *Note, in a grant application the Specific Aims precede the Background section. However, as the proposal may be reviewed by BME faculty who are not experts in the student’s specific field, Background material should be presented in the proposal before Specific Aims are stated.*

   Also because the proposal may be reviewed by BME faculty who are not experts in the student’s specific field, all terminology and methods must be defined and explained.

   The proposal shall be typed in 11 pt Calibri, Arial or Times New Roman font and double spaced, with 1 in margins all around. The proposal must not exceed 20 pages in length, excluding title page, references and CV. Any proposal exceeding 20 pages will be rejected.

4. Proposal submission timing
   The Ph.D. proposal is due by 4 pm on the first Friday of the term starting one calendar year after the student enters the Ph.D. program or the Ph.D. portion of the joint M.E./Ph.D. program. Students admitted to the joint M.E./Ph.D. program enter the Ph.D. portion of the program after completing their first 30 credits. Students in the joint M.E./Ph.D. program are encouraged to
submit their Ph.D. proposal by the end of their fourth term in the M.E./Ph.D. program; if they do not do so, then they must submit a two-page description of the Specific Aims of their intended research project by the last day of classes of their fourth term. Proposals are welcome to be submitted ahead of the deadline; every effort will be made to review the proposals within four weeks of submission, but holidays/academic breaks will add to review time and unavailability of appropriate faculty may also delay review.

When there are extenuating circumstances that prevent a student from submitting the proposal on time, the student may request an extension of the deadline by contacting the Ph.D. Program Director at least two weeks ahead of the deadline. The Ph.D. Program Director will consider the request, but there is no guarantee that the deadline will be extended. Any student who does not submit his/her Ph.D. proposal by the regular (or, when approved, extended) deadline will fail that attempt at the BME Qualifying Examination.

In all cases, according to Graduate School policy, a student may not register for more than 9 credits of BME 960 (Ph.D. Research) prior to passing the Qualifying Examination.

5. Examination committee

Once the student and the thesis advisor agree that the proposal is suitable for submission, the student shall submit the proposal by email to the Ph.D. Program Director. The Ph.D. Program Director will constitute the Qualifying Examination Committee. The Examination Committee must include at least three members of the BME faculty. The Examination Committee may additionally include appropriate members with affiliations outside of the BME program. The student’s thesis advisor may not be a member of the Examination Committee.

6. Proposal evaluation

Not more than four weeks after the proposal has been submitted, the Ph.D. Program Director will notify the student of one of the following outcomes.

i. If the Examination Committee feels that the student is prepared to defend the proposal, the student will be asked to schedule the proposal defense.

   It should be noted that that permission to defend the Ph.D. proposal does not guarantee passage of the Qualifying Examination.

ii. If the Examination Committee feels that the student is not prepared to defend the proposal, the Ph.D. Program Director will compile and send to the student a list of the Examination Committee’s concerns and the student will fail the Qualifying Examination. If it is the student’s first attempt at the Qualifying Examination, the student may continue in the BME Ph.D. program and retake the Qualifying Examination (see #9, below).

7. Defense preparation and format

The student should prepare a 30 min presentation and allocate a total of 2 hrs for the Proposal Defense.

The presentation should provide requisite background material, but focus on the proposed research plan. Presentation of preliminary data in support the research plan is encouraged but not required.
The Examination Committee’s questions, which may be posed during and/or after the presentation, will pertain to the specific research proposal as well as relevant fundamental topics in biomedical engineering.

8. Defense evaluation

The Examination Committee will evaluate whether the student has a sufficiently well focused dissertation project; an understanding of the project and its scientific/technological significance; sufficient scientific acumen to pursue the project reasonably; and basic knowledge in the biomedical engineering field.

The Examination Committee will decide on the day of the defense whether to (i) admit the student to doctoral candidacy, (ii) request additional information from the student or (iii) fail the student.

In case (ii), the Committee will communicate to the student in writing the identified weakness in the proposal and provide the student with a date by which the student must respond to the Committee’s concerns in writing. Subsequently, the Committee will review the student’s response and decide whether to admit the student to doctoral candidacy or fail the student.

In case (iii), the Committee will communicate to the student in writing the identified weaknesses in the proposal.

Once the Committee has decided upon the examination result, a Report on Qualifying Examination/Proposal Defense form must be filed with the Dean of Graduate Academics.

9. Repetition of the Qualifying Examination

If the student fails the Qualifying Examination on first attempt, at any stage of the process, the student will be permitted to continue in the BME Ph.D. program and to retake the Qualifying Examination one time. It is recommended that any student planning to retake the Qualifying Examination meet with the Ph.D. Program Director.

If the student fails the first Qualifying Examination after submission of the written proposal, the student must submit a revised proposal. In the revised proposal, the student must address, to the Committee’s satisfaction, all concerns about the originally submitted proposal.

If the student fails the first Qualifying Examination after the Proposal Defense or after responding to additional, post-defense concerns, the Committee will decide which Qualifying Examination stage(s) the student must repeat.

10. Dissertation Advisory Committee

After a student is admitted to doctoral candidacy, a Dissertation Advisory Committee should be formed. Under the rules of the Graduate School, the Dissertation Committee can be formed only after successful passage of the Qualifying Examination. Regulations governing the Dissertation Committee, Ph.D. thesis and Ph.D. defense can be found in the separate Biomedical Engineering (BME) Doctoral Program: Overview of Requirements document.

Note, the student and the Dissertation Advisory Committee must meet at least once per year.

Proposal-Writing Checklist
Proposal is composed such that it will be comprehensible to biomedical engineering faculty with expertise outside of the particular area of the proposed research project. All concepts and methods are explained, none are assumed to be ‘self-explanatory.’

- Background section includes a focused summary of relevant work in the field and explains all concepts/topics necessary for readers to understand the proposed project and methods.
- If the present project builds on previous work from within the same laboratory, a section of the Background summarizes that work. The student’s own work is later, in the Preliminary Results section, clearly distinguished from previous work by others in the laboratory.
- Specific Aims – at least two, and comprising at most two pages – state research objectives. Each Aim is independent and can be investigated without relying on results of other Aim(s). Each Aim is similar in scope to that of a peer-reviewed journal article.
- All work by others, including that appearing in figures or tables, is cited. For work by others in the same laboratory—if the work is published then a citation is provided, if the work is not published then attribution is included in parentheses in the text, e.g. “(unpublished results of Firstname Lastname).”
- Background or Research Plan provides rationale for experimental design/choices of experimental parameters to be assessed.
- Research plan details experimental and control groups to be investigated; protocol to be followed; quantitative analysis and metrics to be used for evaluation; and statistical methods with which groups will to be compared.
- Research plan considers potential problems and alternative approaches.
- Proposal is written in professional language appropriate to a grant application.
- Proposal includes a significant element of engineering analysis.
- Throughout text, all terms and symbols, including those in figures and tables, are defined on first use.
- All figures and tables are referenced and explained in the text.
- Text in figures and tables is legible. Details of figures, including scale bars, are easily visible.
- Proposal is written in 11 pt Calibri, Arial or Times New Roman font; has 1 in margins all around; is double-spaced; and does not exceed 20 pages, excluding title page, references and CV.
- Pages are numbered.
- Proposal has been checked for spelling and grammar.
- Equations are generated with an equation editor and, if referred to later, are numbered.
- The use of tenses is appropriate throughout the proposal. Background is in past or present tense. Aims are in present tense. Methods are in present or future tense. Research plan is in future tense. Preliminary data are in past or present tense. Expected Impact is in future tense.
- Reference list has been proofed for consistent formatting and completeness.