

BME GRADUATE STUDENT GUIDELINES FOR THE PRELIMINARY EXAMINATION

The Graduate School recognizes only those students who successfully pass the Preliminary Examination as candidates for the Ph.D. degree. The BME department also does not conduct qualifier examinations to assess basic knowledge of the field; therefore, the Preliminary Examination is the only official assessment of student suitability and preparedness for seeking a Ph.D. in BME.

Generally, the Preliminary Examination assesses a student's ability to conduct doctoral research by demonstrating technical competence; critical thought and writing; and the ability to generate a plausible, relevant, and rigorous research plan. The following is the guideline for preparation for the Preliminary Examination. In addition to being familiar with Graduate School requirements for the Preliminary Examination (http://gradschool.duke.edu/academics/degree_reqs/phd_reqs/index.php), it is also critically important for each student to work closely with his or her research advisor, departmental advisor, and thesis committee in preparing for this examination.

Content of the Preliminary Examination. The Preliminary Examination includes both written and oral components. The timing of the examination should be scheduled sufficiently early so that a post-examination change in strategic direction will not result in significant lost effort.

The written component assesses the student's ability to prepare a cogent scientific argument. It must include five key components:

- 1) A literature review from which the key hypotheses and experimental design are justified,
- 2) A list of hypothesis-, design- and/or discovery-driven objectives proposed for study,
- 3) A detailed methodology by which the hypotheses or designs are to be tested,
- 4) A preliminary data section that demonstrates the feasibility of the proposed research, including the student's ability to perform the necessary work, and
- 5) A timeline with the best estimate of how long it will take to complete the proposed work.

The written component has no departmental specification for length or format requirements; however, similar to a research proposal, the written document must be sufficiently detailed so that each of the above areas can be fully evaluated by the thesis committee prior to the oral examination. The written proposal should be confined in scope to the proposed research area, and the "sufficiently detailed to evaluate" criterion should be applied to all sections of the document (e.g. do not recount all prior accomplishments in graduate school, and avoid overly detailed and lengthy literature reviews). The document length shall not exceed single-spaced 25-30 pages including figures and tables, but not including references or appendices. Different research groups expect different formats for this document. It is important that these expectations be discussed with the research advisor prior to preparing the document. Following completion of the written document, the document must be distributed to the committee at least two weeks prior to the oral examination.

The oral component assesses the student's competence in technical areas including prior coursework, knowledge relevant to the proposed research, and broad understanding of the scientific method. It also assesses understanding of the proposed research area, and why the proposed research plan is the most appropriate and

practical approach plan given the current state of scientific understanding and the available resources. Finally, it assesses the student's ability to respond to questions with rational and considered answers founded in the scientific method. Note that questions may be asked to probe the student's depth and breadth of understanding beyond that included in the written document.

The outcome of the oral and written components (pass or fail) must be determined at the time of the oral examination. Also determined at the time of oral examination are revisions to the proposed research plan. This revised plan serves as a set of guidelines for completing the Dissertation. While the natural course of the subsequent research trajectory may deviate from this plan, the thesis committee should be apprised of any significant deviations in a timely manner.

Recommended Timeline for Proceeding to the Preliminary Examination.

Each BME faculty member and each BME graduate student has different interests, needs and expectations; consequently, there is no "one size fits all" approach to successful student mentoring and advising. That said, it is obligatory that each student, and his or her research advisor and thesis committee, be intentional and responsible in progressing towards the Preliminary Examination at an appropriately timely pace.

The BME Graduate Program offers the following timeline for planning purposes. Please note that some aspects of the departmental timeline differ from that recommended by the Graduate School, and that some students will inevitably proceed towards the Preliminary Examination at faster or slower paces than that specified below.

1. In the first year, and by no later than 9 months following matriculation the student shall have identified a research advisor. In BME, the thesis advisor is synonymous with the research advisor, and is almost always the chair of the student's thesis supervisory committee. The research advisor is thus the primary source of information and resources regarding departmental requirements, course selection, research direction, and progress towards degree. In the vast majority of cases the research advisor is identified prior to the student arriving on campus.

In certain cases students may be admitted to the graduate program without prior identification of the research advisor. In these instances the Director of Graduate Studies will assign a temporary advisor to monitor student progress until the research advisor is identified by no later than the 9th month following matriculation.

2. In the first year, and by no later than 12 months following matriculation the student shall have identified a departmental advisor. The departmental advisor is someone other than the research advisor and the Director of Graduate Studies who is familiar with the student's research topic and/or is a faculty member with whom the student has particularly good rapport. The role of the departmental advisor is to ensure that a second faculty member, besides the research advisor, is well aware of the student's aspirations and progress. The departmental advisor can be especially valuable when matters arise outside the research advisor's expertise, when there are conflicts between the student and the research advisor, or when the occasional "sanity check" is desired. The Departmental Advisor Form can be obtained from the BME Graduate Program Office.

3. In the first or second year, and by no later than 24 months following matriculation the student shall schedule a “pre-prelim” meeting that includes at least his or her research and departmental advisors. The agenda for this meeting shall include a review of the student's course work to date, a discussion of the student's research progress to date, and a discussion of the student's plans for the formation of the full thesis committee. The outcome of this meeting is a **written** communication to the Director of Graduate Studies from the research and department advisors that states whether or not the student is making satisfactory progress towards the Preliminary Examination.

Any student pursuing a MS degree in BME on the way to the doctorate may use this meeting as the MS examining committee as long as the student complies with the requirements for a course work or thesis MS as described on the BME web site at <http://www.bme.duke.edu/grads/curriculum.php>.

4. In the second or third year, and by no later than 36 months following matriculation the student shall have identified a full thesis committee. Graduate School requirements state that: *“As early in a student's course of study as is practicable and not later than two months (60 days) before the Preliminary Examination, the Director of Graduate Studies in the major department will nominate a supervising committee for the approval of the Dean. The committee consists of at least four members, with one member designated as chair. This committee should include at least three graduate faculty members of the major department and, usually, at least one from outside the department.”*

In the BME graduate program, all students who stand for the Preliminary Examination must have a thesis committee comprised of at least five persons, although only four committee members are specified: the research advisor (typically the chair of the committee) who must have a primary or secondary appointment in BME, at least three BME faculty members (including the committee chair) one of whom must have a primary appointment in BME, and at least one cognate member from outside the department (typically from a clinical or basic medical science department). The fifth committee member is at the student's discretion. Note that this is one more committee member than the Graduate School's requirement of four committee members.

5. In the third or fourth year, and by no later than 48 months following matriculation the student shall have stood for the Preliminary Examination. Graduate School requirements state that: *“Ordinarily a student registered for full-time study should pass the Preliminary Examination by the end of the third year. A student who has not passed the examination by this time must file a statement with the Dean of the Graduate School, approved by the Director of Graduate Studies in the major department, explaining the delay and setting a date for the examination. Except under unusual circumstances, extension will not be granted beyond the middle of the fourth year.”*

The BME department applies the same criteria as the Graduate School, but extends the targeted time for standing for the Preliminary Examination from the middle of the fourth year (month 42) to the end of the fourth year (month 48). Students who are not prepared to stand for their Preliminary Examination by the 48th month following matriculation (1) must provide a **written** explanation to the Director of Graduate Studies by month 48, and (2) must schedule a meeting with his or her full thesis committee as

soon as possible to discuss the student's progress towards the degree. Acceptable written explanations for postponing of the Preliminary Examination may include but are not limited to changing research advisors, substantially changing research projects, a Graduate School approved leave of absence (e.g. military, health, maternity or family leave), or an advisor approved extended off-campus activity (e.g. a year-long internship, research, training or educational experience).

It is the responsibility of the student, and the student's research advisor and thesis committee, to comply with this expectation. Failure to comply may result in removal from the BME graduate program.

Achieving Candidacy: Standing for and passing the Preliminary Examination.

Graduate School requirements state that: *"A student must be registered during the term in which he or she takes the Preliminary Examination. Successful completion of the Preliminary Examination requires at least three affirmative votes and no more than one negative vote. The sole exception to this policy is that a negative vote cast by the chair of the examining committee will mean a failure on the examination. A student who fails the Preliminary Examination may apply, with the consent of the full supervisory thesis committee and the Dean of the Graduate School, for the privilege of a second examination to be taken no earlier than three months after the date of the first. Successful completion of the second examination requires the affirmative vote of all committee members. Failure on the second examination will render a student ineligible to continue a program for the Ph.D. degree at Duke University."*

Passing the Preliminary Examination is the only means for proceeding to the Ph.D. degree; in BME however, passing this exam is not sufficient grounds for garnering a MS degree en route to the Ph.D. Students who wish to obtain a MS in BME must comply with the departmental requirements of presenting a written thesis (thesis option) or presenting a poster (coursework option) as described on the BME web site at <http://www.bme.duke.edu/grads/curriculum.php>.

The Final Step: Standing for and passing the thesis defense. Although the process for preparing, distributing, and defending the dissertation is much the same as the Preliminary Examination, there are a number of specific procedures and filing dates that absolutely must be adhered to. It is critical that students be completely familiar with Graduate School requirements for student registration, thesis preparation, thesis submission, and scheduling the defense date. Failure to do so may result in additional costs and substantial delays. Relevant website pages describing the administrative requirements and deadlines are <http://gradschool.duke.edu/academics/theses/index.php> http://gradschool.duke.edu/academics/grad_deadlines.php

Typically, BME graduate students stand for their thesis defense approximately 2 years following passage of the Preliminary Examination, well short of the 4 year allowable time window stipulated by the Graduate School. Students should consider holding at least one meeting with the full thesis committee in the time between passing the Preliminary Examination and the scheduled defense date. This meeting provides an opportunity to discuss progress of the research, make course corrections, and reach consensus on tasks and content that must be incorporated for the dissertation to be *"a mature and competent piece of writing, embodying the results of significant and original research."*

Approved by BME faculty 3/1/2010