

Qualifying Exam Process

Prior to being formally admitted to candidacy for the Ph.D. degree, the student must demonstrate knowledge of bioengineering fundamentals and potential for research by passing a qualifying oral examination. Potential for research is demonstrated by completing an outstanding bioengineering research project and testimony of the student's research advisor of their research potential. Typically the exam is taken shortly after the student earns the masters degree and all students are expected to take the PhD qualifying examination by the end of their 8th quarter at Stanford.

Purpose of the Exam

The PhD qualification exam has several goals.

- 1) To motivate students to review and synthesize course work and research material
- 2) To determine the student's ability to understand and apply fundamental concepts
- 3) To develop and test the student's ability to communicate orally and to respond to questions and comments
- 4) To evaluate the student's potential to pursue doctoral research
- 5) To identify areas that need to be strengthened for the student to be successful as a PhD student, independent scholar, and teacher.
- 6) To provide a mechanism for a range of faculty to come to know the student's capabilities

Procedure for the Exam

The procedure for the exam consists of six steps.

- 1) An Academic Council Faculty Member must be willing to supervise the student's PhD program and dissertation. The decision by the faculty member to supervise the student's program and dissertation is based on the potential of the student to become an independent scholar and is based on several factors. The most important factor is the direct knowledge the faculty sponsor has obtained of the student's research capabilities (e.g., as acquired through supervising the student in a multi-quarter project course, independent study, or as Research Assistant). Other factors include the student's undergraduate and graduate course record, graduate record exam scores, and research, teaching and professional experience. The student must have a graduate Stanford GPA of 3.25 to be eligible for the exam. Students typically have a GPA of 3.50. Students are encouraged to take the exam during the academic year and to work together to prepare for the exam.
- 2) Once an Academic Council Faculty Member agrees to be the "faculty sponsor," (based on the students demonstrated excellence in research) the student must submit an application folder containing the items listed below (a-f) to initiate the PhD Qualification Exam. The faculty sponsor will notify the department faculty that the application has been submitted and is on file for perusal by the faculty at the

Student Services Office. Normally, the application will be discussed at the next faculty meeting (but no sooner than one week). The application should contain the following:

- a) Updated transcripts of all undergraduate and graduate course work
 - b) Curriculum vitae
 - c) Calculation showing the student's GPA for courses taken at Stanford (Please exclude research and activity courses).
<http://studentaffairs.stanford.edu/registrar/students/gpa-how>
 - d) Research project title and abstract (< 300 words). This abstract should be written by the student and represent research performed by the student. The abstract will describe the topic on which the student would lecture if asked (see below)
 - e) Preliminary dissertation proposal (< 3 pages). Knowledge and work of the student, and/or others, should be synthesized to present a rationale for the proposed dissertation topic (e.g., theory to be developed, hypotheses to be tested) as well as proposed methodology to fulfill the dissertation objective.
 - f) A list of four independent areas in which the student feels he/she has depth. One of these areas must come from a fundamental engineering topic (e.g., thermodynamics, fluid mechanics, control systems, signal processing, mathematics). A second area must be from a biological or medical specialty (e.g., molecular biology, cell biology, neurophysiology, cardiovascular medicine). The other two areas may come from any medical, biological, bioengineering, or other engineering topics that lead to a cohesive program of graduate study (e.g., genetics, developmental biology, biotechnology, neurology, medical imaging, computer graphics, mathematics, robotics, polymer physics). The student should discuss these areas with their advisor in the process of planning their graduate program and prior to preparation of their application folder.
- 3) The student, in absentia, will be evaluated by the faculty at one of the Bioengineering Department faculty meetings. The student's faculty sponsor must be present at the meeting and be willing to attest to the student's excellent research performance and their potential for outstanding doctoral work. The evaluation will be based primarily on the student's research performance but also on interactions with faculty members during courses, teaching assistantships, and other academic activities. The faculty will determine if the student should be allowed to proceed to the next step in the PhD Qualifying Examination. If the student is not allowed to proceed, the faculty sponsor will convey to the student the reasons for the faculty's decision. Otherwise, the faculty will appoint a subcommittee consisting of three or four faculty, at least two of whom will be Academic Council Members of the Bioengineering Department.
- 4) The subcommittee is to obtain additional information regarding the student's potential to become an independent scholar. To accomplish this objective, the

student will present to the subcommittee a technical lecture (< 15 minutes) on the topic contained in the abstract (see #2d). (One week prior to the lecture, the student will give each subcommittee member a “reminder” containing the short abstract of the lecture, and the time and place of the lecture.) This lecture, followed by a short question/answer session, will be open to all faculty and students. Afterwards, in a closed session (up to 1.5 hrs.) with the subcommittee, the student will answer additional questions regarding the topic presented at the lecture, the four areas chosen by the student (see #2f), the preliminary dissertation proposal (see #2e), or other related topics. (The two-hour time-slot and the place of the lecture and questioning will be arranged by the student and the faculty sponsor with consent of all subcommittee members.) The subcommittee will deliberate on all the information it has acquired (from the preliminary evaluation by all the faculty [see #3], and from the lecture and the question/answer session) and will decide on a recommendation of pass, conditional pass, or fail (see #5). This recommendation will be communicated to the student.

5) Possible outcomes are that the student:

a) Passes unconditionally;

b) Passes conditionally;

In this case, the faculty will outline the weaknesses and how the conditions the student could (or must) fulfill before reconsideration (e.g., specific courses must be taken with performance at a specified level; communication skills need to be improved as evidenced by ...). With the faculty sponsors' endorsement, the student will later request a change from “conditional pass” to “pass” after he/she believes that the conditions have been fulfilled. The student will outline in this request the reasons for this belief. The faculty will meet again to act on the request.

c) Fails, with or without option to retake.

6) The student's sponsor will notify the student and the Student Services Office of the results of the examination.