

## EXAM INSTRUCTIONS

### I. Purpose of the Qualifying Exam

To be officially considered as admitted to candidacy in the Ph.D. program, applicants must pass a qualifying exam. The exam is designed to:

- a. Evaluate the student's fundamental knowledge in selected core areas of mechanical engineering
- b. Evaluate the student's capacity to perform outstanding research
- c. Evaluate the student's communication skills and ability to maneuver through complex engineering problems
- d. Identify areas that need strengthening as the student works towards his/her Ph.D.

### II. Format Overview

The Ph.D. Qualifying Exam consists of two components, a written examination and an oral examination. Both components must be passed in order for a student to be admitted to candidacy in the Ph.D. program.

#### a. Written Examination

- i. Content: Students will select two subject areas (from Table X) which support their Ph.D. research. The topics will cover fundamental material with the expectation of a graduate-level understanding of the subjects. The exam is closed book format. The time limit to complete each written exam is 2 hours. Students may obtain a corresponding syllabus for each subject area in order to prepare for the written exam. A student can pick topics within a single group or across groups.
- ii. Committee: Each subject area will have two predetermined, proficient exam writers and evaluators. These examiners will be selected by the respective Groups administering these subject areas.
- iii. When to take the written exam: Students will take the written exam no later than the third semester in the Ph.D. Program. Summer does not count as a semester. During the first week of the semester students will submit a Notification of Intent to Take the Written Component of the Qualifying Exam. Written exams will be administered during the 13th week of the Fall and Spring semesters and will be scheduled on a specific date and time. No exceptions to the time and location of the exam can be made.
- iv. Extensions: Students may petition the Graduate Committee for an extension prior to taking the exam, if extenuating circumstances have left the student at an unfair disadvantage. Students can petition for a one semester extension during the first week of the semester.
- v. Evaluation: Each subject area examiner will have a distinct vote (pass/fail) and each student must receive **two pass votes** in order to pass each subject area. A student must retake a subject area if two fail votes are received. In the event of a split vote, either (a) the student will receive a fail for that subject area and must retake that written exam, or (b) the examiners have the option to schedule an in-person, oral follow-up session and decide the final outcome (pass/fail).

1. The follow-up session must occur no later than 1 week following the written exam and may be up to 45 minutes per topic.
  2. Some groups may require a mandatory follow-up oral component to the written exam in some subject areas. Specific information on such a mandatory follow-up will be provided to students at the time of confirmation of their qualifying exam subjects from the graduate academic advisor.
- vi. Results: A student must pass both subject area written exams in order to pass the written component of the qualifying exam.

**Table X: Written Exam Subject Areas**

<i>Organizing Group</i>	<i>Subject Area (Relevant Course)<sup>1</sup></i>
Design, Ergonomics, Manufacturing and Systems	<b>Design</b> (based on graduate level understanding of topics covered in ME 3000) <b>Manufacturing</b> (based on graduate level understanding of material covered in ME EN 2650)
Robotics and Controls	<b>Robotics</b> (ME EN 6220) <b>Classical Control Systems</b> (ME EN 6200) <b>System Dynamics</b> (ME EN 6205)  <i>*Students enrolled in the Robotics Track must take the Robotics exam. The other exam must be Classical Control Systems or System Dynamics.</i>
Solid Mechanics	<b>Advanced Strengths</b> (ME EN 6300) <b>Finite Element Analysis</b> (ME EN 6510) <b>Continuum Mechanics</b> (ME EN 6530) <b>Biomechanics</b> (ME EN 6540) <b>Composites</b> (ME EN 6520) <b>Fracture</b> (ME EN 7530)
Thermal Fluids and Energy Systems	<b>Fluid Mechanics</b> (ME EN 6700) <b>Heat Transfer</b> (Int. Heat Transfer ME EN 6960) <b>Thermodynamics</b> (ME EN 6600)

**b. Oral Examination**

- i. Content: The oral presentation during the Ph.D. Research Proposal Defense constitutes the oral component of the Ph.D. Qualifying Exam. Students must have passed the Canvas plagiarism quiz before the proposal defense. Any student who has not fulfilled this requirement will automatically fail the oral component of the qualifying exam and this will count as one of the student's attempts. (*Refer to Section IV of the Graduate Handbook for more details and requirements for the Ph.D. Research Proposal Defense*)
- ii. Committee: The supervisory committee serves as the examining committee for the oral component of the qualifying exam.
- iii. When to take the oral exam: Students will take the oral exam within two semesters of passing the written exam. Summer does not count as a

<sup>1</sup> Where graduate courses are listed, it is expected that the student is competent in his/her understanding of the underlying fundamental content covered in the corresponding undergraduate course(s).

semester. During the first week of the semester students will submit (a) a Notification of Intent to Take the Oral Component of the Qualifying Exam and (b) a Request for Supervisory Committee form. Students will work with their supervisory committee to determine a defense date and time. Students must schedule the oral exam/defense with the graduate advisor at least two weeks prior to the exam.

- iv. Extensions: Students may petition the Graduate Committee for an extension prior to taking either exam, if extenuating circumstances have left the student at an unfair disadvantage. Students may petition for a one semester extension during the first week of the semester
- v. Evaluation: All members of the supervisory committee must vote pass on the oral presentation during the Proposal Defense in order for the student to pass the oral component of the exam. A student may either fully pass the exam, pass the exam with corrections or conditions from the committee, or fail the exam. A student must perform the proposal defense over if any one member of the supervisory committee votes a fail on the exam.