

Qualifying Examination for Admission to the Ph.D. Programs in the Industrial and Enterprise Systems Engineering Department

Effective Fall 2009; allowed Fall 2008

Students may apply for admission to the Ph.D. program in Industrial Engineering upon receiving a B.S. degree or an M.S. degree in an engineering or related discipline. In general, students entering the program with a B.S. degree should take the Qualifying Examination (the Qual) before obtaining the M.S. degree. Students entering the Ph.D. program with a B.S. degree are encouraged to take their qualifying examinations no later than the fifth semester after beginning their graduate study. Students entering the Ph.D. program with a M.S. degree should take their qualifying examinations no later than their third semester of enrollment.

The Ph.D. degree requirements in Industrial Engineering and Systems and Entrepreneurial Engineering are structured to assure depth in the student's area of research, and at the same time, to assure breadth in engineering. Admission to Ph.D. candidacy is based on the faculty's evaluation of the student's research potential, scholastic competence as evidenced by grades, and satisfactory performance on the Qual.

To be permitted to take the Qual all students must meet the following requirements:

1. A signed MS/PhD Advisor Agreement Form must be on file in the IESE Graduate Department office.
2. 8 credit hours of 500-level coursework must be completed in IE and/or GE courses, other than the thesis credit courses (IE or GE 599).
3. A grade point average of at least 3.25 must have been attained on all graduate coursework completed and also on all 500-level coursework completed.

The Qual will have two parts. The **Written Examination** will serve to examine the student in three 400-level courses selected from the attached list. The purpose of the written exam is to determine sufficient knowledge in core areas of the IE and SEE programs and to evaluate the candidate's ability to think conceptually in the selected area at and beyond the standard undergraduate level. (*Students must attain a minimum score of 70% in each area of the written examination to pass.*)

For the second part of the Qual, the students will undergo an oral examination, given by the Oral Examination Committee (OEC) in the focus area of the student's research. The oral examination is intended to show sufficient depth of understanding of an area related to the student's research.

The OEC will assign the student one journal paper to critically appraise during the oral exam in terms of:

- overall significance
- influence on the development of the field
- possible future research directions in the area of the paper, and
- connections to the student's research interests.

To avoid conflict of interest, no papers authored or co-authored by departmental faculty will be assigned for the oral examination. The presentation should be 25 minutes in length, leaving 35 minutes for questions. Questioning may range beyond the material in the assigned paper, and may include questions relating to the student's written examination problems.

Students should not expect to defend their research in the Oral Examination.

The Graduate Committee will oversee preparation of the written portion of the Qual, and administer and evaluate results prior to the oral portion of the Qual. The Graduate Committee will consist of a minimum of 6 members, whose research and teaching cover the main research thrusts of the department, as delineated by the course selection list. The Graduate Committee will recommend to the Department Head 2 members who have expertise in each area to serve on the Oral examination committee. Additionally, at least one member who has expertise in another area will be appointed to each of the oral examination area committees by the Department Head. The student's faculty advisor cannot be a member of the oral examination committee (but may attend the examination if desired).

The decision to pass or fail a student will be made on the basis of the student attaining a minimum requirement of 70% in each area of the written examination, performance on the oral exam, grades in formal courses, and recommendation by the Thesis advisor. A student who fails any portion of the Qual may repeat that portion of the exam in the subsequent semester. If desired, the student may choose to take the written exam in a different area to make up a failed portion of the written exam, however, this option will be considered the second exam attempt. A student who fails the exam on the second attempt will not be allowed to continue in the PhD program.

The written portion of the Qual will be administered in the second week of the Fall semester, with a makeup examination held in the second week of the Spring semester, as necessary. The oral portions of the Qual will be held during the fourth or fifth weeks of the Fall semester with make-up exams during the third or fourth weeks of the Spring semester, as necessary. The oral exam committees for each area will be determined before the completion of the semester preceding the exam.

IESE Written Qualifying Examination Course List

The IESE qualifying exam will consist of three one-hour written examinations. Each one-hour portion will cover material from 1 of 3 selected courses, selected from the list below. The 3 courses must be chosen from 3 distinct areas. The student and his/her advisor will select the 3 areas, and in the case where more than one course is listed, will also select the specific course. The courses correspond directly to **core 400-level courses** in the associated area.

- Controls:
 1. GE 424 -State Space Design Methods in Control

- Mechanics and Structures:
 1. GE 410 -Component Design
 2. GE 413 -Engineering Design Optimization

- Optimization:
 1. IE 411 -Optimization of Large Linear Systems

- Stochastic Systems:
 1. IE 410 -Stochastic Processes

- Systems Design and Production:
 1. GE 411/IE 435 -Intro to Reliability Engineering
 2. GE 498-HMK -Quality Engineering
 3. GE 498-AA -Decision Analysis
 4. GE 498-AY -Introduction to Systems and Entrepreneurial Engineering