October 2014

Mechanical Engineering Ph.D. Qualifying Examination – Goals and Scheduling Guidelines

The goals of the ME Ph.D. Qualifying Examination are (1) to test students' understanding of fundamental knowledge in the areas of mechanical engineering relevant to their research and (2) to test their abilities to conduct Ph.D. research. Students are to take the Qualifying Examination within one year of receiving their Master's Degree. For those students who enter the program with a Bachelor's degree and are pursuing the regular Ph.D. track, the Qualifying Examination shall be taken in the semester in which the thirty-sixth hour of graduate credit is earned.

The ME Ph.D. Qualifying Examination has two parts. The first part is a subject-area exam designed to test fundamental knowledge of both undergraduate-and graduate-level coursework. The second part is a research-ability exam designed to determine Ph.D.-level research capability. During the latter exam the student must make a presentation on research done prior to taking the Qualifying Examination.

The Qualifying Examination is given once each semester.

Coursework (Subject-Area) Examination:

- The coursework or subject-area exam is primarily a written exam, with the possibility of an oral follow-up component for retakes that score between 4 and 7. First time testers who do not score 7 or higher will retake the exam at the next offering. Students must choose two subject areas from the following list in which to be tested.

    - Computational Science and Engineering
    - Controls
    - Dynamics and Vibrations
    - Fluid Mechanics
    - Heat Transfer
    - Manufacturing
    - Materials Behavior
    - Materials Processing
    - Solid Mechanics
    - Thermodynamics

- The coursework exam is 3 hours in duration, 90 minutes per subject area. A student who completes the first area exam before the end of 90 minutes may not begin the next area until the next period. Once a period is over, that exam is turned in and closed; a student may not return to an area after its period has ended. Each student may choose to work on their two area exams in any order, but a student is not allowed to look at an exam until the beginning of the appropriate 90-minute period. Retakes of previously failed areas are to be done in the first period.

- Generally four problems are provided and the students asked to work three, although some areas may have minor exceptions (*e.g.*, work all four problems). *All work should be done in the exam booklets provided, one problem per booklet.*

- Students should bring their I-cards to the exam. *Students should not write their name or any other identifying information (other than UIN) on the exam booklet.*

- The coursework exam will be closed book and closed notes. Standard, non-programmable calculators will be provided for students to use in the exam.

- The result of the exam in each subject area will be either pass or fail for first-time testers (7 or higher is pass, below 7 is fail). That is the final outcome of that subject-area exam; there is no oral follow-up questioning. Retakes that score between 7 and 4 will be provided the option of an oral exam. In these cases, oral follow-up questioning will be conducted to determine that subject-area's outcome. These exams are ½ hour in length. Students will be notified of the results of their coursework exam at the end of the first full week following the examination.

Research Examination:

The research examination is scheduled during the *second* week following the coursework exam. The research exam is a 60-minute oral exam. During this exam the student must give a 30-minute Research Presentation, based on research done prior to his/her Qualifying Examination. The student is expected to be familiar with the technical content of the material presented and related fundamentals. After the Research Presentation the committee will ask questions for 30 minutes on the research work presented, the student's knowledge of research methodology, in general, and fundamentals related to the research topic.

- The research exam committee will consist of three MechSE faculty, some of whom will have expertise in the Coursework and Research exam areas and some of whom may not have expertise in those areas.

- The student's research advisor does not attend the oral exam.

- The scope of the Research Presentation is roughly that of a conference paper, a journal paper, or an M.S. thesis. The topic of the research presentation could be the student's Master's Degree work, for students holding that degree. For others it should be research conducted with their Ph.D. advisor at UIUC. Since the purpose of the exam is to evaluate ability to conduct Ph.D. research, a presentation consisting primarily of a literature search listing numerous papers but lacking in significant interpretive content that assesses the current state-of-knowledge and research needs in a particular area will likely be viewed as insufficient. A detailed list of evaluation criteria is attached.

- A two-page extended abstract on the Research Presentation must be submitted to the Graduate Programs office for approval prior to the exam

- The result of the Research Exam will be either pass or fail.

Examination Outcome and Retakes

To pass the Qualifying Exam a student must pass both of the coursework exams and the research exam. Each of these three pass requirements is independent. Students who fail any part of the exam on the first attempt should consult with their advisors about preparation for a possible retake attempt. Students will be allowed one additional opportunity to retake any failed coursework or research exam. Retakes must be taken at the next available offering.

Retakes will follow the same format and rules as described above for first-time takers with the following exception: when the result of a coursework retake exam is fail, an opportunity for oral follow-up questioning will still be provided. This will normally be scheduled during the week of research (oral) exams. The result of this oral exam determines the overall final result in that coursework area and must be either pass or fail.

QUALIFYING EXAM - RESEARCH EXAM

GUIDELINES FOR THE EVALUATION CRITERIA

EVALUATION CRITERIA	COMMENTS
1. Intellectual Merit (Depth of understanding) (7 points)	
a) Clarity of Problem Statement	
b) Motivation: Why is this problem important?	
c) Methodology: Why a given method/approach was used?	
d) Results and their interpretation; understanding a physical meaning of parameters, or measured quantities	
e) Experimental/theoretical connection if applicable. If theoretical research: Understanding of experimental data and parameters used in theory; If experimental research: Understanding of published theoretical results relevant to research	
f) Conclusions	
g) Future Research/Extensions	
h) Impact of Research/ Bigger picture	
2. Questions/Answers (2 points)	
3. Quality of Presentation (1 point)	
a) Clarity and Organization of Presentation	
b) Presentation Skills	
c) Quality of viewgraphs	
GENERAL COMMENTS	