

E. **Ph.D. Qualifying Examination**

All doctoral students in the Department of Aerospace Engineering and Engineering Mechanics are required to pass a candidacy examination, hereafter referred to as Ph.D. Qualifying examination, in accordance with the rules and guidelines of the *Handbook of the Division of Graduate Studies and Research*, Sections 8.5 and 8.6. In order to take the exam, a student must have at least a 3.25 overall GPA and at least a 3.0 GPA in the major. Passing the exam is only one of the requirements for candidacy (see *Handbook of the Division of Graduate Studies and Research*, Section 8.7 and Section V. below).

The Ph.D. Qualifying Examination will consist of two parts: a written examination and an oral examination to be given only after passing the written examination. The objective and examination grading are based on the student's:

- (1) Understanding of engineering concepts and ability to apply these concepts in research and design.
- (2) Ability to critically analyze an engineering problem
- (3) Ability to organize and communicate a body of knowledge
- (4) Ability to answer questions related to a defined body of knowledge.

IT IS EXPECTED THAT THE STUDENT SHOULD SHOW A THOROUGH UNDERSTANDING OF UNDERLYING PHYSICAL AND MATHEMATICAL CONCEPTS, AND DEMONSTRATE THE ABILITY TO SUCCESSFULLY COMPLETE AN ORIGINAL RESEARCH DISSERTATION.

Any Graduate student, whether holding a MS degree or not, who has declared his/her intention to pursue a Ph.D. degree is a Doctoral student and as such is required to pass the Ph.D. Qualifying Examination and is subject to the requirements of this Section.

1. **Time Requirements**

The Ph.D. Qualifying Examination is given twice a year, normally in the middle of the Autumn and Spring quarters.

A student entering the doctoral program must pass the exam no later than two years **after** his/her entrance into the Ph.D. program. A student may not take the Ph.D. Qualifying Exam more than two times and may be denied a retake due to poor performance on the first try (see Section 4, Part c below), or if this retake would violate the above time requirements. (This paragraph amended 10/21/2004.)

In exceptional cases the time requirements specified above may be waived upon petition to the Graduate Director (see Section 2 below).

2. **Petition Requirements**

A student wishing to depart from the time requirements noted above must notify the Department Graduate Committee by petition of his/her intentions. This **written petition**, detailing the reasons for the departure, must be **received and approved prior** to the scheduled exam.

A student wishing to take the Qualifying Examination in the Fall or Spring quarter must notify the Department Graduate Office, utilizing the form provided by that office, of his/her intention before the posted deadline (generally three weeks before the exam date). On the form, the student must indicate his/her major area and must secure the signature of a faculty member who has agreed to act as the student's dissertation advisor after the student has passed the examination.

Approved AsE/EM major areas of study are (1) Dynamics & Controls; (2) Fluid Mechanics & Propulsion; or (3) Solids & Structures.

3. Special requirement for foreign students

Foreign students subject to TOEFL requirements are strongly urged to pass the Oral English Proficiency Exam before taking the PhD Qualifying Examination because of the language skills required for the oral portions of the exam.

4. The Ph.D. Qualifying Examination

All students who apply for the Ph.D. Qualifying Examination will have access to prior exam questions, although not necessarily to solutions, from at least the prior two years. Each major area provides to the Graduate Office a list of Qualifying Examination topics that the exam may cover. Faculty in each of the major areas maintains these topic lists. The Graduate Office will provide the latest topic list available from each group on-line.

The exam shall consist of a written part and an oral part. The oral is taken only if a passing grade is achieved on the written part.

a. Written Exam

The written examination is an eight-hour, open-book examination consisting of four questions, with three questions in the major area of study and one question in mathematics relevant to the major area of study. All questions will be prepared and graded by faculty members in the major area of study. A passing grade on at least three of the four questions is required to pass the written portion of the qualifying examination. For any question that is failed, the faculty member will provide to the Graduate Office a written justification for the failing grade. (This paragraph amended 10/21/2004.)

b. Oral Exam

Prior to the oral examination, the student will meet with his/her potential dissertation advisor to define a specific topic in the student's major area of interest and to identify appropriate source material for an oral examination. This material will consist of seminal literature from books, journal articles, and conference proceedings that are related to the student's major area of study and to the student's intended doctoral research area.

Following passage of the written examination the student will prepare for the oral seminar and examination. The student must schedule the oral examination as described below.

The student will first distribute a double-spaced, typed review of the literature to be presented in the seminar. It should be kept in mind that additional background information might be needed to fully explain the literature. This information should be obtained and understood. Copies of this review should be given to the faculty members of the major area of study and to the Graduate Office at least one week before the seminar. This review should be a maximum of ten (10) pages with a maximum of five (5) references and a minimum font size of 12 points. The written review must

1. highlight the key concepts of the material,
2. critically assess the major technical contributions and applications and
3. explain the significance to the major field of study.

The student can confer with faculty members during the preparation of this document; however, **the document must not be edited by any faculty member.**

At the oral exam, the student will present an uninterrupted seminar open to all faculty and students of at least twenty (20) minutes in length but no longer than thirty (30) minutes. This will be followed by a question and answer period, typically lasting thirty to sixty minutes, which is open only to the Department faculty and any designated persons outside the faculty to whom the Department faculty present indicate no objections. Questions on source material, engineering fundamentals, and topics broadly related to the source material and major area will be allowed.

Upon completion of the seminar and oral examination, all Department faculty members present at the seminar will vote on the outcome of the examination using the criteria found at the beginning of Section E above. A majority vote is required in order to pass. The oral examination will be given once, unless the examiners, by majority vote, recommend a second and final oral presentation. If a second oral exam is recommended, it must be completed before the end of the following quarter. The examiners may also, by majority vote, require the student to retake the written examination. A student who does not pass the oral examination will not be denied a chance to retake the examination, subject to the time limitations of Section E Part 1 above.

c. Procedure

An application to take the Ph.D. Qualifying Examination must be completed and returned to the Graduate Office no later than the posted deadline, generally three weeks before the date of the written examination.

The topic must be chosen, and the seminar must be scheduled by the student and registered with the Graduate Office no later than two weeks after notification of having passed the written examination, and must be completed by the end of the quarter. The notification to the Graduate Office must include an indication, either via a faculty sign-off sheet or by email messages to the Graduate Director, that the scheduled time for the seminar is acceptable to a majority of faculty members in the major area of study. It is expected that the student will work diligently to find a time suitable for as many faculty as possible, not a simple majority. A written seminar announcement stating the time and place of the presentation must be distributed to all members of the faculty at least one week before the scheduled date.

All Department faculty members of the student's major area of study are expected to be present at the oral examination; however, all members of the Department faculty are welcome, as are other persons to whom the faculty members present have no objection. A minimum of three (3) Department faculty members must be present.

Failure of the student to meet any of the requirements stated in this section is justification for failure of the PhD Qualifying Examination.

d. Change of Major

If a student changes major area of study, the entire Ph.D. examination must be repeated.

e. Right to Review Failed Questions

The following information regarding a student's performance on the examination shall become part of the student's Departmental file and as such will be available for review upon request to the Director of Graduate Studies:

- The breakdown of the four (4) grades received in the written exam;
- Written justification for any failing grade, if applicable.

In addition, for a period of **three weeks** from the date of notification of the results of the examination, a student who failed a question, either written or oral, may request a meeting with the appropriate faculty member at a mutually acceptable time in order to discuss the question. For written examination questions, a photocopy of the graded question will be provided to the faculty member. **The examination books will be destroyed after this three-week period plus any period required for the meeting, but in any event will not be held past the end of the quarter in which the written examination was taken.**