

ECE Ph.D. Qualifying Exam – Format and Description

The Ph.D. Qualifying Exam is the first of three exams required by the University of New Mexico and the Electrical and Computer Engineering Department.

Effective Date of the Current Exam Format

This exam format has become effective at the beginning of the 2020 Fall semester.

Overview

The Ph.D. Qualifying Exam will now take the form of an oral presentation, an oral exam, and a written proposal based on an assigned reading of a publication in the student's area of research (emphasis). Following the presentation, there will be a question and answer period, which will include topics relevant to the presentation and fundamental concepts in the student's emphasis area. The Exam aims to assess the student's knowledge of the fundamentals in the chosen area of research, their ability to understand and present basic research, and their readiness for conducting research. The basic process will be as follows.

1. A Qualifying Exam Committee will be formed when the student announces his, her or their intent to take the Exam. The Committee will consist of 3 members, all of whom are regular (tenured or tenure track) faculty in the ECE Department. The Area Chair in the student's emphasis area will be responsible for forming the Exam Committee.
2. The Exam Committee will compile a list of at least three significant publications in the emphasis area, one of which will be the basis of the Exam. The Exam Committee may consult any faculty in the student's concentration when selecting the papers.
3. The student will pick one publication from this list.
4. After reading the paper, and any necessary background, the student will give a 30-minute oral presentation to the Committee with a concise description of the background, methods, and results of the selected paper. In addition, the student must present the results of his/her critical analysis of the paper and hypothesis about future directions. A question and answer period will follow the presentation.
5. Additionally, the student must prepare a short (no more than three pages) research proposal describing his or her plan for extending or continuing the research described in the publication.
6. In the event that the student does not pass the Exam, he or she will have one additional chance to retake it and pass. In the event of a second failure, the student will not be allowed to continue in the ECE Ph.D. Program (EE or CompE).

Purpose

The Ph.D. qualifying exam recommendations are meant to measure

- the student's potential to conduct independent research,
- the student's ability to express and defend technical ideas both in writing and orally,

- the student's fundamental understanding of the chosen area of research,
- the student's breadth of view of the general area of research,
- the student's scholastic competence,
- the student's ability to provide constructive criticism and support to peers in the context of writing a professional paper and in an oral discussion.

Format

The Exam will consist of a written report and an oral presentation followed by an oral exam. The student will choose a paper from a list of **at least three peer-reviewed articles** or papers. The student will also be responsible for informing the Ph. D. Qualifying Committee of the selected paper. These papers should be broadly based on the student's potential area of research and representative of the state-of-the-art in said field. The list of papers will be determined by the **Ph. D. Qualifying Exam Committee (or Exam Committee)**, which will also administer the Exam.

The **oral presentation** will be in the form of a private seminar. Within the private seminar, the student must present a concise description of the background, methods, and results of the selected paper. In addition, the student must present the results of his/her critical analysis of the paper and hypothesis about future directions. The oral presentation must use PowerPoint or equivalent presentation software. The oral presentation must lead with a 15-minute review and critical analysis of the paper, followed by a 15-minute presentation of a novel research proposal related to the focus of the selected paper and the student's potential area of research.

The oral presentation must cover the following point

The Exam Committee will then conduct an **oral examination** that does not exceed 1 hour. The oral examination will include questions related to the oral presentation and testing general knowledge covered in the core courses within the student's area of research.

The **written report** must be in the format of an **original research proposal**, and it is not to exceed three single-column pages. Margins in all directions must be 1 inch. The student must use one of the typefaces identified below:

- Arial at a font size of 10 points or larger
- Times New Roman at a font size of 11 points or larger.

The student is strongly encouraged to use the outline below for the original research proposal. Note that the outline is not restrictive.

Suggested outline of the original research proposal.

1. Main Objectives

- a. What are you proposing to do?
- b. What scientific question(s) and/or technological challenges are you aiming to address and resolve?
- c. Why is this important?

2. Approach and Background

- a. How is the proposed research aiming to tackle the challenges / to achieve the goals?
- b. How is it done today, and what are the limits of current practice?
- c. What is new in your approach, and why do you think it will be successful?

3. Basis for the Proposed Research

- a. What recent observations/discoveries/achievements (by yourself or others) make you believe that your approach will be successful?

4. *Research Plan*

- a. What methods will be used, and why are these most appropriate?
- b. Specific activities (brief descriptions)
- c. Breakthroughs needed/expected in order to achieve the objectives
- d. Why are you or your team/facility the best or uniquely qualified to pursue the proposed research?

5. *Expected Outcome*

- a. How do you measure the success of this effort?

6. *Potential Impact*

- a. If you are successful, what difference will it make?

The student may contact the Committee Chair to seek clarification about the required content and the format of the oral presentation and the oral Exam. The student may also contact previous and current instructors of the core courses to discuss fundamental concepts.

Prerequisites

A student will be allowed to take the Ph.D. qualifying exam if the following requirements are satisfied:

- enrollment in the ECE Ph.D. program,
- completion of all required core courses,
- approval by the student's graduate study advisor.

In certain circumstances, with approval of the ECE Graduate Committee, a student may: (i) replace the required core courses with equivalent courses taken at other institutions or (ii) by taking advanced courses that are above the level of the core courses, or (iii) a combination of (i) and (ii).

Ph.D. Qualifying Exam Committee

The Ph. D. Qualifying Exam Committee will be comprised of **three tenured or tenure-track faculty** in the ECE Department. **The student's advisor may be on the Ph. D. Qualifying Exam Committee. The student's advisor is not to serve as Chair.** It is recommended that the Exam Committee includes previous or current instructors of the core courses in the student's concentration. The Chair in the student's area of research (**Area Chair**) or concentration will be **responsible for forming the Ph. D. Qualifying Exam Committee.** The ECE Graduate Office will contact the Area Chair to request the selection of the Exam Committee. The process will begin with the student filling up Step 1 of the Ph. D. Qualifying Exam Form and filing the Form with the ECE Graduate Office before the deadline.

Criteria for Assessment

The Committee must determine whether the student is ready to pursue Ph.D. level research and the Ph.D. degree based on the written report, graduate course grades to date, and this Exam. The Ph.D. Qualifying Committee will assess the student based on the following rubric.

| Criteria | Does not meet expectations (1) | Meets expectations (2) | Exceeds expectations (3) |
|--|-----------------------------------|---------------------------|-----------------------------|
| Ability to present a succinct oral synopsis of the assigned paper. | | | |
| Ability to critically evaluate the assigned paper. | | | |
| Ability to express and defend technical ideas both in writing and orally. | | | |
| Ability to clearly and concisely articulate the proposed research direction in writing and orally. | | | |
| Ability to correctly answer fundamental knowledge questions drawing on material covered in the core courses of the student's concentration and in the chosen area of research. | | | |

Exam Outcomes and Recommendations

The Ph.D. Qualifying Exam Committee will review each student's research proposal, attend the private seminar, and conduct the oral Exam to make recommendations. Every member of the Committee will record a recommendation for *pass* or *fail* on the exam form. The Committee's final recommendation for *pass* or *fail* will be made using a majority rule and recorded by the Chair on the exam form.

- Exam outcomes after the first try will be: *pass* or *fail*. A fail recommendation in the first attempt of the Ph.D. Qualifying Exam will require that the Ph. D. Qualifying Exam Committee provides the student with a specific set of remedial actions the student should pursue before retaking the Exam.
- Exam outcomes for the second try can only be *pass* or *fail*. A fail recommendation precludes the student from retaking the Exam, resulting in the student to be eliminated from the Ph. D. program.

Schedule

- Students are expected to take the Ph. D. Qualifying Exam for the first time before the end of the fourth regular semester of study (not including summer sessions).
- ***The Ph.D. Qualifying Exam may be administered at any time within the semester.***
- Students must file a Qualifying Exam Proposal Form with the ECE graduate office at least ***six weeks before their proposed Exam date.*** The Ph. D. Qualifying Exam Proposal

Form will be available on the UNM-ECE website for download. The student will initially fill out Step 1 of the Exam form.

- Upon receiving the Exam Form, the ECE Graduate Office will notify the Chair of the student's chosen area of research, who will form the Ph. D. Qualifying Exam Committee. The Committee Chair will record the names and contact details of the Committee members on Step 2 of the Exam Form.
- The Exam Committee will select a list of papers for the Exam, as specified previously. The Committee Chair will record the selected papers on Step 3 of the Exam Form. The Committee Chair will be responsible for signing the Exam Form and sending it to the student *at least four weeks before the proposed Exam date*.
- ***The student will be responsible for selecting a paper within the shortlist and reaching out to the Exam Committee to schedule the presentation and the oral examination.***
- The student will be responsible for specifying the selected paper for the Exam and the time and date of the presentation and the oral examination on Step 4 of the Exam Form.
- ***The Exam Form must be signed by the Director of the Graduate Program (Step 5 of the Form).***
- On the day of the examination, each student will be examined by the Ph. D. Qualifying Exam Committee.
- The student must email the Ph. D. Qualifying Exam Committee members his/her written report, approved by the Ph. D. Qualifying Exam Committee Chair, *at least one week prior to the scheduled Exam date*.
- The Exam Committee must record the results of the Exam on Steps 6-8 of the Exam form.
- The Graduate Committee Chair must present the results of the Exam with justifications and recommendations to the Graduate Committee for a vote. The Graduate Committee will formulate a recommendation on the exam outcome, record it on Step 9 of the Exam Form, and bring it to the ECE faculty for a vote.
- The Graduate Committee Chair will record the vote by the ECE faculty on Step 10 of the Form.
- The student will be notified of the outcome of the Exam after the vote by the ECE faculty.