

University of Delaware
Department of Electrical and Computer Engineering
Qualifying Exam Rules
September 30, 2023

Admission to Candidacy

To be formally admitted into Ph.D. candidacy, students must successfully complete the Ph.D. Qualifying Examination and have a Research and Study Program approved by the student's research advisor and the ECE Graduate Committee.

GPA requirement to Take the Qualifying Examination

- Candidates who started the Ph.D. in the ECE program without an M.S. degree in ECE must have completed at least four Foundation courses with a GPA of at least 3.50. If more than four Foundation courses have been completed, only the four ones with the highest grade will count to compute the GPA. Unless a rare exception is granted by the Graduate Committee, all the courses should be completed in-person.

If the GPA is less than 3.50, and provided that her/his research advisor approves, a candidate may retake Foundation courses, or take additional Foundation courses up to a maximum of six in total, to satisfy the 3.50 GPA requirement prior to the next Qualifying exam offering. Only the four highest grades achieved in all the Foundation courses will count to compute the GPA requirement for the Qualifying Examination.

- Candidates who started the Ph.D. in the ECE program with an M.S. degree in ECE at another institution have the one-time option to satisfy the GPA requirement by completing four ELEG/CPEG graduate courses. Enrollment in these courses must be approved by the Graduate Committee, which could waive at most two courses for students with excellent coursework in their M.S. At least two of the courses must be Foundation courses in the student's area of concentration. In order to take the Qualifying Examination, the GPA for the required courses must be at least 3.50. Unless a rare exception is granted by the Graduate Committee, all the courses should be completed in-person.

If the GPA is less than 3.50, and provided that her/his research advisor approves, a candidate may retake Foundation courses, or take additional Foundation courses up to a maximum of six in total. The next time the Qualifying Examination is offered, the candidate will be required to satisfy the same GPA requirement as candidates who started their Ph.D. in ECE without an M.S. degree in ECE.

Qualifying Examination

The Qualifying Examination will consist of a research report and oral examination. The objective is to assess the research aptitude of a doctoral student in the early stages of the program. The Qualifying Examination will be offered in June and January and will include:

1. A research report, equivalent to a four-page conference publication. The topic of the research report will be in the area of research of the student and will thus be selected by the advisor and the doctoral student. The report will reflect the research progress of the student. It should provide sufficient background materials to convey the big picture to an examiner outside the immediate area of the student, the expected impact of the research, as well as a summary of the contributions of the student to date, and possible research approaches.
 - a. The report should be an original document produced wholly by the doctoral student and will be run through plagiarism detection software.
 - b. The research report must be submitted to the Chair of the ECE Graduate Committee at least three weeks prior to the Qualifying Examination (exact due date to be relayed to students), and will be distributed to faculty examiners.
2. Oral examination, consisting of a short oral presentation (20-30 minutes in duration), followed by a period of discussion, for a total duration of approximately 60 minutes. The oral presentation will be based on the above research report. The discussion period will revolve around foundational aspects of the problem presented and of the corresponding research area; a list of fundamental topics per research area will be established by the faculty examiners and research advisor and provided to the examinee at least two weeks before the exam. The discussion period will also provide constructive feedback. The oral examination should also assess the student's ability to creatively think about the research problem presented.

Examiners: The ECE Graduate Committee will select three ECE voting faculty members to examine each student, one of which will be assigned as the exam committee Chair. The selection of the committee will be based on the match between the faculty and the student's research topic and Foundation courses. One faculty examiner should be outside of the student's area of expertise. The student should be able to explain acronyms, technical jargon, and assumptions to an educated non-expert. The student's research advisor may also be present as an observer, but is not allowed to vote on the outcome of the qualifying examination. The advisor could stay for the first few minutes of deliberations in order to provide input on the student's research performance and get feedback on areas of improvement. The advisor and student will not be present during the final grade deliberations by the committee. The exam committee chair will be responsible to coordinate the creation and distribution of the list of fundamental topics and record the committee comments which would be conveyed to the student.

Passing of the student will be determined by the committee using following rubric:

1. Ability to communicate (research report/presentation)
2. Technical knowledge (research report/presentation)
3. Fundamental knowledge
4. Research aptitude, creativity, productivity and overall performance

For each of the four criteria above, each committee member will grade the student as Pass/Fail taking into account the following factors:

- Grades of the courses selected to fulfill the Qualifying Examination GPA requirement.
- Quality of the written research report.
- Performance of the student in the oral examination.

- Feedback from the research advisor, who will comment on criteria related to the student's overall performance, including work ethics, research aptitude, creativity, productivity.

The majority of the committee will determine whether the student passes or fails each criterion in the rubric. The student must pass in three of the four criteria.

The outcomes of the Qualifying Examination will be (i) outright pass, (ii) first fail, or (iii) second fail. If the student fails for the first time, the faculty examiners will specify the parameters for taking the Qualifying Examination for a second time. There will be no third chance provided for a student to take the Qualifying Examination. The student should pass the exam within the first two years since admission into the program. A student who ultimately fails the Qualifying Examination for a second time is not eligible to continue in the PhD program, but may apply to change her/his matriculation to the M.S. in ECE degree program. In this case, either the thesis or the non-thesis track can be selected.

Appeal Process: Candidates may appeal their qualifying examination results. Appeals must consist of evidence supporting the candidate's case and a letter of support from the candidate's research advisor. Appeals are submitted to the Graduate Committee. Note there must be compelling evidence to overturn qualifying examination results and successful appeals are expected to be rare. Appeals must be received within one week of posted qualifying examination results. The Graduate Committee will act on all appeals within one week.

Research and Study Program

Students must submit a Research and Study Program (RSP) prior to taking the Qualifying Examination. The RSP details: (1) all courses taken by the student, (2) all future courses planned to be taken in fulfillment of the degree requirements, (3) an abstract of the research to be undertaken in fulfillment of the degree requirements, and (4) a list of the individuals that have agreed to serve on the student's dissertation committee.

Foundation Courses

The ECE Department offers two Foundation Courses in each one of the following concentration areas:

Computer Systems

CPEG 621: Compiler Design

CPEG/ELEG 652: Principles of Parallel Computer Architectures

Network Science

CPEG/ELEG 651: Computer Networks II

CPEG 657: Search and Data Mining

Communications Engineering

ELEG 630: Information Theory

ELEG 635: Digital Communication

Signal Processing

ELEG 631: Digital Signal Processing

ELEG 815: Analytics I – Statistical Learning

Nanoelectronics

ELEG 622: Electronic Materials Processing

ELEG 646: Nanoelectronic Device Principles

Electromagnetics & Photonics

ELEG 682: Optics & Photonics

ELEG 648: Advanced Engineering Electromagnetics

Biomedical Engineering

ELEG 679: Introduction to Medical Imaging Systems

ELEG 604 Imaging and Deep Learning

Cybersecurity

CPEG 672 Applied Cryptography

CPEG/ELEG 694 System Hardening and Protection

Integrated Circuit Design

CPEG 624 Analog Integrated Circuit Design

CPEG 660 Introduction to VLSI Systems