The student shall be responsible for forming a dissertation guidance committee which shall consist of the student’s academic advisor and additional faculty members recommended by the advisor. For the PhD program, the minimum number of additional faculty members on the dissertation guidance committee is three, and at least two of the committee must be within the ECSE program areas (Computer Engineering, Electrical Engineering, and Systems and Control Engineering). The chairperson of the dissertation guidance committee is normally the candidate’s research advisor.

Students may change advisors for a variety of reasons of which one of the most common is a change of the student’s field of interest. It should be noted that a change in research advisor may require that the student start a new research project, which could result in delaying graduation. It is the responsibility of the student to inform the ECSE Office of Student Affairs in the event of a change in advisor.

Appeals
Any decision by an academic advisor, dissertation guidance committee or Department Associate Chairperson may be appealed, in writing, to the Department Associate Chairperson who shall present the appeal, with their recommendations, to the faculty at its next regular faculty meeting. The faculty’s decision shall be final.

PhD Degree Program
In order to successfully complete the PhD Degree Program, a student must satisfy the following requirements:

- Select a major dissertation subject area in Electrical Engineering, Computer Engineering, or Systems and Control Engineering
- Fulfill all PhD course requirements in the chosen major area (see individual degree requirements below)
- Have an approved Program of Study and complete the CWRU courses in the approved Program of Study with a cumulative grade point average of 3.25 or greater
- Successfully complete the PhD Qualifying Examination
- Successfully complete the PhD Proposal Defense
- Successfully complete and defend the PhD Dissertation
- Fulfill the PhD residency requirement

PhD Candidacy
The final consideration of whether to admit the student to PhD candidacy will be taken by the PhD Qualifying Committee (for Electrical Engineering and Computer Engineering students) or the student’s dissertation guidance committee (for Systems and Control Engineering students) after the student has passed the PhD Qualifier. A written report on the results of the qualifier and PhD candidacy will be prepared by the committee and submitted to the Department Chairperson, who, in turn, will notify the School of Graduate Studies of the results.

PhD Proposal
After passing the Qualifier and being admitted to PhD candidacy, the PhD candidate is required to pass a Dissertation Proposal Exam on a timely basis, generally within one semester after being admitted to candidacy. This exam shall be administered by the student’s dissertation guidance committee and consists of a written dissertation proposal and an oral presentation of the proposed dissertation research. As part of the oral presentation, the student will be expected to answer questions covering the proposed research as well as questions on related topics as deemed appropriate by the student’s dissertation guidance committee.
The written dissertation proposal must be received by the committee members at least ten days before the date scheduled for the oral exam and presentation. The Dissertation Proposal Exam, the PhD research, the final oral dissertation defense, and all other requirements in the student’s PhD program of study must be completed within five years after the student is admitted to PhD candidacy.

The PhD Oral Defense

The student shall provide an announcement containing a title, abstract, date, time and location of the defense to the ECSE Office of Student Affairs for general distribution at least 10 days in advance of the thesis defense.

The PhD Residency Requirements

All PhD students shall fulfill the PhD residency requirements set forth by the Case School of Engineering and the School of Graduate Studies. Specifically, the PhD student is required either to register for at least 9 credit hours during each of two consecutive semesters or to engage in academic work (taking courses, assisting in course development and/or teaching, fully engaging in research, or some other scholarly activities) in at least six consecutive terms (fall, spring, or summer) between matriculation and a period not exceeding 5 years after the first credited hour of ECSE 701 Dissertation Ph.D. The period during a leave of absence cannot be counted to fulfill the residency requirement.

PhD Policies

For PhD policies and procedures, please review the School of Graduate Studies section of the General Bulletin.

Program Requirements

Course Requirements and Academic Program

Each Computer Engineering PhD student is required to have an Academic Program, approved by the academic advisor, Department Chairperson, and Dean of Graduate Studies, that includes a minimum of 36 credit hours of coursework beyond the BS degree. At least 18 credit hours of coursework must be taken at CWRU. In addition, the student is also required to complete a minimum of 18 credit hours of ECSE 701 Dissertation Ph.D. to fulfill the requirement for PhD-level research. Acceptable courses include suitable CWRU courses at the 400 level or higher and approved graduate-level courses taken at other institutions. Students holding an MS degree in an appropriate field of study from CWRU or another degree-granting institution may apply up to 18 credit hours of coursework completed for their MS degree towards the aforementioned 36 credit hour requirement.

Each PhD student is required to have a fully-approved Academic Program before taking the PhD Qualifying examination and before registering for the final 18 credit hours of the program. The Academic Program shall be prepared by the student and approved by the research advisor or the permanent academic advisor in the case where the research advisor is not in the Department.

An Academic Program must meet the following requirements:

- A minimum of two courses in mathematics, statistics, or basic science.
- At least six approved courses from the student’s major area of study. At least 4 of these courses must be from within the ECSE department.
- Four additional courses that are not listed under the student’s major program area. These courses should satisfy the requirement for breadth in the student’s program of study.
- A minimum of 18 hours of PhD Dissertation research as noted by enrollment in and successful completion of ECSE 701 Dissertation Ph.D.
- Successful completion of ECSE 400T Graduate Teaching I, ECSE 500T Graduate Teaching II and ECSE 600T Graduate Teaching III.
- Successful completion of the ECSE 500 ECSE Colloquium requirement (see below)

The above represents the minimum course requirements beyond the BS degree. The total number of 3 credit hour courses in the Academic Program is at least twelve (12) beyond the BS level. The selection of these courses should be done with guidance from the student’s permanent academic advisor. Any additional courses may be in any one of the above categories as approved by the student’s advisor.

ECSE Colloquium and Presentation Requirement

The PhD program includes a colloquium and public presentation requirement.

- All PhD students are required to register for and pass ECSE 500 ECSE Colloquium for a total of three semesters of the PhD Program, and this is expected before Advancement to Candidacy. This is a 0 credit hour required course. Students, such as part-time students working in industry, may propose an alternative arrangement for fulfilling this requirement, by submitting a written petition to the Graduate Studies Committee.
- All PhD students must give a public presentation of their research, in addition to their PhD dissertation defense. This presentation must be given either at a research conference, in the ECSE seminar series, workshop presentations or similar presentations in a public venue. MS thesis and PhD dissertation defenses cannot be used to fulfill the public presentation requirement.

Additional details and the associated forms can be acquired from the ECSE Office of Student Affairs.

PhD Qualifying Examination

A student shall be admitted to PhD candidacy only after they have passed the PhD Qualifying Examination. The Qualifying Exam is intended to test the students’ knowledge in the student’s chosen major program area of Computer Engineering. The objectives of the exam are:

- To assess the PhD student’s understanding of the fundamental concepts in Computer Engineering as embodied in the respective graduate curriculum.
- To ensure that the student have the ability to pursue PhD level research, and have mastered the graduate level coursework necessary to succeed as researchers

Full-time PhD students are recommended to take the PhD qualifier before the beginning of their third semester of full-time (or equivalent) enrollment, and must pass the exam within two years of being admitted to the program. For part-time students, the Qualifying Exam must be passed before more than 27 credit hours of coursework have been completed. For students who must take remedial courses to make up for shortcomings in their engineering and mathematics knowledge base, the deadline can be extended to the fifth semester of full-time (or equivalent) enrollment, but this requires a petition to the ECSE Graduate Committee. Students have two opportunities to pass the PhD Qualifier. A student who fails to pass the Qualifier after two attempts will not be allowed to continue in the PhD program in the Department of Electrical, Computer, and Systems Engineering.
To pass the PhD Qualifier, the student must demonstrate proficiency in two parts:

**Part 1: Computer Engineering**
Part 1 of the PhD Qualifier will consist of a written examination with questions drawn from several course areas listed below. At least three (3) topic areas must be pursued by the student for a complete qualifier. The exam style is a mini-project oriented, take home test that must be completed within a one week period.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECSE 315</td>
<td>Digital Systems Design</td>
<td>4</td>
</tr>
<tr>
<td>ECSE 401</td>
<td>Digital Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 419</td>
<td>Computer System Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 485</td>
<td>VLSI Systems</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 488</td>
<td>Embedded Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 425</td>
<td>Computer Networks I</td>
<td>3</td>
</tr>
</tbody>
</table>

Additional topic areas may be assigned depending on the student interests and recommendations from their advisors.

If a student fails all three areas of the written examination, the entire exam must be taken again. If a student fails some areas, the faculty may elect to give another exam to the student in just the areas failed.

The written part of the Qualifying Exam for Computer Engineering will be offered at least once a year at the end of the spring semester.

**Part 2: Computer Engineering**
Part 2 will consist of an oral exam based on the areas of the written examination. However, the oral exam may be waived if the student has performed well in all three topic areas of the written exam.