

Ph.D. in Electrical Engineering

Degree Requirements

To graduate, students must have an approved dissertation and are expected to attain an overall GPA of at least 3.5. Students need always to get departmental approval for the courses they take for their degree requirements.

Ph.D. in Electrical Engineering (students with a master's in electrical engineering or equivalent)

Code	Title	Credits
Electives		
700-level courses ¹		12
Dissertation		
ECE 790	Doctrl Dissrtn & Research ²	0
Seminar		
ECE 791	Graduate Seminar ³	0
Total Credits		12

¹ No more than 6 credits may be ECE 725 Independent Study I or ECE 726 Independent Study II Independent Study. 700-level courses may be substituted by 600-level courses if the academic advisor appeals on behalf of the student to the Office of Graduate Studies and receives approval. Additionally, ECE 630, ECE 632, ECE 639, ECE 681, ECE 657, ECE 618, ECE 692, ECE 690, ECE 605 and ECE 666 can be 700-level course substitutes because of lack of 700-level course in these tracks. Whether or not a program requires additional courses above the aforementioned minimum requirements, a Ph.D. student's dissertation committee may ask the student to take additional courses.

² Ph.D. students who pass the Qualifying Examination (QE) must then register for 3 credits of pre-doctoral research(ECE 792B Pre-Doctoral Research) per semester until they defend successfully the dissertation proposal. Ph.D. students who defend the dissertation proposal successfully must then register for the 1-credit dissertation course (ECE 790A Doctrl Dissrtn & Research) each semester until they complete all degree requirements. Students may take courses simultaneously with the 790 or 792 course as per Ph.D. program guidelines or dissertation committee recommendation.

³ Students must register six semesters for this seminar. Student must attend at least 5 seminars per semester. Part-time students may request that this requirement be waived for some semesters.

Ph.D. in Electrical Engineering (students with a Baccalaureate degree in electrical engineering or equivalent)

Code	Title	Credits
Electives		
600-700-level courses ¹		36
Dissertation		
ECE 790	Doctrl Dissrtn & Research ²	0
Seminar		
ECE 791	Graduate Seminar ³	0
Total Credits		36

¹ Ph.D. students with a recognized Baccalaureate degree are required to take eight 600-level or 700-level 3-credit courses (24 credits) of coursework beyond the Baccalaureate degree as well as four additional 700-level 3-credit courses (12 credits), for a total of twelve 3-credit courses (36 credits). Master's project (course 700), Master's thesis (course 701), or more than two independent study courses (courses 725 and 726) cannot be used to satisfy these coursework requirements. No more than 6 credits may be ECE 725 Independent Study I or ECE 726 Independent Study II . 700-level courses may be substituted by 600-level courses if the academic advisor appeals on behalf of the student to the Office of Graduate Studies and receives approval. Additionally, ECE 630, ECE 632, ECE 639, ECE 681, ECE 657, ECE 618, ECE 692, ECE 690, ECE 605 and ECE 666 can be replaced as 700-level courses because of lack of 700-level course in these tracks. Whether or not a program requires additional courses above the aforementioned minimum requirements, a Ph.D. student's dissertation committee may ask the student to take additional courses.

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Deadlines

Students who do not meet the following deadlines will be dismissed from the Ph.D. program.

- The required coursework for the Ph.D. program and the (major part of the) QE must be completed successfully by the end of the second year in the program.
- The dissertation proposal must be defended successfully either by the end of the third year in the Ph.D. program or four semesters after registering for the first time in the 792 pre-doctoral research course, whichever occurs earlier.
- The dissertation must be defended successfully by the end of the sixth year in the Ph.D. program.

Selection of Dissertation Advisor

Students must select a dissertation topic and advisor within 6 months of joining the program. Advisors are assigned based on student preferences and availability of funding. Change of advisor requires consent of the previous advisor and departmental approval. In cases where more than one advisor is directing the dissertation, the primary advisor must be on the core departmental faculty.

Qualifying Examination

Goal: ECE Department's qualifying exam needs to be a constructive component in the development of a student's research skills and along with the course work requirements to identify students qualified for research.

Exam Structure: The Ph. D. Qualifying Exam has two parts: I) GPA requirement on selected courses, and II) Research potential assessment.

Part I. GPA Course Requirements:

ECE Course Requirement: Prequalified doctoral students are required to pass four courses selected from a list of relevant doctoral courses ("core courses") with a GPA of at least 3.5 or higher.

Each research group (Communications, Signal Processing and Microwave; Computer Networking; Computer Architecture, Electronic and Photonic Devices; and Intelligent Systems) has its own list of courses. Courses are listed at the bottom of this section.

Part II. Research Potential Assessment Oral Qualifier:

The research potential assessment oral qualifying examination must be taken within the first year from the time the student starts the Ph.D. program if he/she has a MS degree. In the case of a student accepted into the BS-Ph.D. track, the exam must be taken within two years from the time the student starts the Ph.D. program. For the students accepted with a MS degree, within the first two semesters from the time the student starts the Ph.D. program the student must complete one Independent Research course in his/her research area of interest. For the Independent Research course, the student registers with a faculty member who may or may not be the student's prospective Ph.D. advisor.

The oral exam committee will be assigned by the Associate Chair for Graduate Studies of the ECE Department. It will be chaired by a faculty member from an area different from the student's area of interest. In addition to the Chair, the committee will include three faculty members in the student's area of interest. The supervisor of the independent research work or the student's prospective advisor may be part of the committee.

A student must send in an official application for taking the oral Qualifying exam to the Associate Chair for Graduate Studies, at least one month before the target date of the oral exam committee. The student is responsible to find a time such that all committee members can attend. In the application, the student should identify the research focus area for the exam and outline how the course requirements (if any) for that focus area have been met.

For the oral exam, the student will prepare a written report to the committee and to the associate chair for graduate studies at least one week before the exam date. The report should be written following the standard format of a conference paper, with 4-6 pages in double column, font size 11. The subject of the oral exam is to be chosen by the student. It is recommended that this choice be made in consultation with a faculty advisor and the ECE associate chair for graduate studies. A suitable basis for the examination may include, but is not restricted to:

- A paper/report (conference, journal, technical report, patent, and/or published or submitted) • A conference paper submission based on research under the supervision of a faculty advisor.
- An M.S. thesis in preparation or previously completed thesis
- A final project report derived from an ECE Independent Study course.

During the exam the student will make a 30-minute oral presentation of his/her own independent research to the oral exam committee.

The oral presentation will be followed by an open-ended question and answer session that may include questions specific to the research project as well as questions generally relevant to the research area regarding fundamental knowledge underpinning the project topic. In addition, basic questions from various different areas can be asked to determine student's breadth of understanding.

Since this examination will occur in the early stages of research, and since the oral exam is not a doctoral defense, the presented paper need not lead to a Ph.D. thesis proposal. For the examination committee, evaluation of the originality and novelty of the research contribution will be secondary to an evaluation of the student's critical thinking skills. Specifically, the committee will focus on the student's ability to analyze, interpret and articulate both strengths and weaknesses of the work. Outstanding students, who have published several papers prior to starting their Ph.D. program, are encouraged to take the oral qualifying exam during the first semester of the Ph.D. program.

The committee will provide a written evaluation of the student's potential for Ph.D. research (in terms of technical ability, and oral and written communications skill) to the department. The committee members can seek input from the prospective Ph.D. advisor when making such evaluation, but the advisor is excluded from participating in formulating the written evaluation. Each member of the Ph. D. Qualifying committee votes to pass or fail the student. The written report should include the vote. The vote of 3:1 or 4:0 is needed for the student to pass the Ph.D. Qualifying Exam.

The ECE department will make the final decision of pass or fail based on the exam committee's report. The student will be allowed two chances to take the Ph.D. Qualifying Exam. The second attempt must be taken within six months from the time the student made the first qualifying exam. Failure to do so will automatically dismiss the student's qualification for further doctoral study.

The Ph. D. Qualifying Exam is offered year around. Five Areas of the Ph. D. Qualifying Exam

- Communications, Signal Processing and Microwave
- Computer Networking
- Computer Architecture
- Electronic and Photonic Devices
- Intelligent Systems

The student needs to select a minimum of 4 courses out of 6 courses (or equivalent) required by each area: Students can take additional courses as per the advisement of area. Here are the suggested courses for different areas:

Communication	Signal Processing	Microwave	Networking	Computer Architecture	Electronic & Photonic	Intelligent Systems
ECE 725	ECE 725	ECE 725	ECE 725	ECE 725	ECE 725	ECE 725
ECE 726	ECE 726	ECE 726	ECE 726	ECE 726	ECE 726	ECE 726
ECE 742	ECE 740	ECE 742	ECE 783	ECE 690	ECE 758	ECE 788
ECE 744	ECE 743	ECE 630	ECE 681	ECE 758	ECE 657	ECE 666
ECE 776	ECE 788	ECE 632	ECE 744	ECE 692	ECE 756	ECE 605
ECE 777	ECE 777	ECE 744	ECE 639	ECE 689	ECE 618	ECE 618

Formation of Dissertation Committee

A dissertation committee must be formed within three months after passing the qualifying examination. The dissertation committee must be approved by the ECE Department Graduate Affairs Committee at the time of its formation and before the presentation of the research proposal. The dissertation committee chairperson typically is the doctoral candidate's program advisor, but other faculty may be selected, provided that they are from the ECE Department. The committee consists of a minimum of five members, one of whom is external to the ECE Department or to NJIT, and at least three of whom are members of the ECE department. The dissertation advisor must be a tenure-track or tenured faculty member at NJIT. If the dissertation advisor is an ECE department faculty member, then the chair of the student's dissertation committee may be any tenure-track or tenured faculty member in the ECE Department at NJIT. If the dissertation advisor is not a member of the ECE department at NJIT, then the chair of the student's dissertation committee must be a tenured faculty member in the ECE department at NJIT. If the dissertation advisor is not an ECE department faculty member, there must be a co-advisor who is a tenure-track or tenured faculty member in the ECE department at NJIT.

Research Proposal

Doctoral candidates must prepare a written research proposal for approval by their dissertation committee. The proposal must be presented after formation of the committee but within twelve months after passing the qualifying exam. The proposal should show that facilities are available to do the work. Research is expected to investigate or develop a unique contribution to science and technology. Research may be experimental, analytical, applied, or theoretical, provided it satisfies these criteria and is approved by the dissertation committee. The research proposal would normally include title and goal of the proposed dissertation; a detailed discussion of background material, including a literature search; a summary of work accomplished to date; a statement of how the residency requirement will be met; and a proposed time table for completion of research.

Dissertation and Defense

A dissertation should demonstrate original research that contributes to knowledge in the field. The dissertation should result in scholarly publication and must be defended in a publicly-announced oral defense. A typed version of the completed dissertation should be available to the committee at least three (3) weeks before the oral defense is scheduled and an unbound copy of the thesis should be available in the Department Secretary's office (235 ECEC) three weeks before the defense. Successful defense of the dissertation is determined by vote of the dissertation committee. All members of the committee must be present to hear the defense. In regard to format, the standard reference is the latest edition of the Estrin/Roche manual Guidelines for Scientific and Professional Theses. The Office of Graduate Studies policies on number of copies, deadlines, and submission of dissertation and abstracts are also to be followed. Every member of the dissertation committee must sign the approval page of the final dissertation document. Students cannot be certified by the ECE department for the doctoral degree until the student publishes at least one paper in a peer-reviewed journal deemed of acceptable quality by the dissertation advisor.