ELECTRICAL AND COMPUTER ENGINEERING (PHD)

Electrical and Computer Engineering Department (https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/)

NYSED: 08821 **HEGIS:** 0909.00 **CIP:** 14.1001

Program Description

A century ago, the radio offered mass entertainment; 50 years later, television replaced it. Today we watch movies on handheld devices. Each evolutionary step was made possible by advances in electrical engineering. The PhD in Electrical and Computer Engineering program is filled with students and faculty keenly aware of this cycle of progress. They prize the Tandon School of Engineering's emphasis on invention, innovation, and entrepreneurship — what we call i2e — and they maintain that emphasis through top-flight laboratories and a fierce dedication to advanced research.

Your studies with us will prepare you for a research career in electrical and computer engineering after graduation. But you'll also be capable of sharing these lessons with your own students, should you choose to teach at the university level.

Urban Science Doctoral Track

The optional Urban Science Doctoral Track (https://engineering.nyu.edu/urban-science-sensing-complexity-informatics-doctoral-track/) is specifically designed for students who want to focus on urban science through a cohesive array of in-class and experiential learning activities, while pursuing their PhD at NYU Tandon. Doctoral track students will engage with CUSP's urban science faculty, experts in methodological aspects pertaining to complexity (dynamical systems, multi-agent systems, network science, and risk engineering), informatics (AI, machine learning, and robotics), and sensing (Internet of Things, smart infrastructure, wireless).

Admissions

To apply for admission to any Tandon graduate program, please contact the Office of Graduate Admissions (https://engineering.nyu.edu/admissions/graduate/).

Entrance Requirement

Students entering the PhD in Electrical and Computer Engineering program are normally expected to have an MS in Electrical Engineering. Generally, admission to the PhD program is conditional on a student achieving a 3.5 grade point average in prior BS and MS programs.

Program Requirements

The program requires the completion of 75 credits, comprised of the following:

Course	Title	Credits
ECE Core Courses		
Select 12 credits of ECE-GY courses numbered at the 6000, 7000, or 8000 level in consultation with a PhD adviser [1]		12
ECE Elective		
Select 3 credits of any ECE-GY lectured courses (in addition to the above core courses) [2]		3
Non-ECE Electives		
Select 6 credits of lectured graduate courses that are not from the ECE-GY or MG-GY subject areas. [3]		6
Flexible Courses		
Select 9 credits from any lectured graduate course [4]		9
Free Electives		
Select 24 credits of graduate level courses in consultation with a PhD adviser [5]		24
Seminar		
ECE-GY 9900	Seminar in Electrical and Computer Engineering (must be taken at least 4 times) [6]	0
Qualifying Exam		
RE-GY 9990	PHD QUALIFYING EXAM	0
Area Exam		
ECE-GY 9980	Electrical Engineering Area Exam	0
Dissertation		
ECE-GY 999X	PhD Dissertation in Electrical Engineering Dept (taken multiple times, for a total of 21 credits) [7]	21
Total Credits		**75**

1. Cannot be transferred in. The following courses may count as ECE Core, ECE Electives, Flexible Courses, or Free Electives: ROB-GY 6003 Foundations of Robotics, ROB-GY 6213 Robot Localization and Navigation, ROB-GY 6323 Reinforcement Learning and Optimal Control for Autonomous Systems I, ROB-GY 6333 Networked Robotics Systems, Cooperative Control and Swarming, and ROB-GY 6423 Interactive Medical Robotics.
2. Can be transferred in.
3. Can be transferred in. These courses' subject codes cannot be ECE-GY or MG-GY, neither can they be courses form the School of Professional Studies.
4. Excluding ECE-GY 999X, and courses from the School of Professional Studies. Can be transferred in.
5. Can be transferred in. Non-lectured courses may only count as Free Electives. Non-lectured courses include Internship courses (CP-GY 9941 Internship for PhD I, CP-GY 9951 Internship for PhD II, CP-GY 9961 Internship for PhD III, and CP-GY 9971 Internship for PhD IV), Guided Studies (ECE-GY 6015 Guided Std in Elec Engr and ECE-GY 6020 Guided Std in Elec Engr), Readings (ECE-GY 9933 Readings in Electrical and Computer Engineering I), Projects (ECE-GY 9941 Advanced Projects III, ECE-GY 9953 Advanced Project, and ECE-GY 9963 Advanced Project II), and MS Thesis (ECE-GY 997X MS Thesis in Electrical & Computer Engineering Department). Additional dissertation courses (ECE-GY 999X PhD Dissertation in Electrical Engineering Dept) beyond the minimum required may also count as Free Electives.
6. ENGR-GH 7900 Graduate Seminar Series may also count toward the seminar requirement. Students are required to register in the seminar for at least 4 semesters. Satisfactory grade is given only if the student attends more than 2/3 of the seminars offered in a semester. Part-time students who have difficulty attending the seminar because of work obligations may be exempted from this requirement upon approval of the Program Director. Students should submit the approval note when applying for graduation.
7. GA-GY 9993 Writing and Communication for Engineers and Scientists may count as dissertation credit.

GPA Requirement

The PhD in Electrical Engineering has several GPA requirements. **1. Core GPA**: A GPA of 3.5 or higher is required in the four core courses. Each individual core course requires a grade of B or better. **2. Formal Course GPA**: A GPA of 3.5 or better is required in all formal courses taken. Formal courses do not include MS thesis, the qualifying exam, the area exam, dissertation, independent studies, projects, readings, internship, or transfer credits. **3. Cumulative GPA**: A cumulative GPA (overall GPA) of 3.0 or higher is required in all courses taken.

Transfer Credits

PhD students with a prior MS degree may transfer up to 36 credits from their MS to the PhD. Students admitted without a prior MS degree may transfer at most 6 credits of relevant graduate courses. MS credits are most often transferred as a blanket 30 credits and appear on the NYU transcript as a set of 30 credits, without naming the specific MS courses in which these credits were earned. Transfer credits may count as ECE Elective, Non-ECE Electives, Flexible Courses, and Free Electives in the chart above. Transfer credits may not count toward the Core Courses requirement or the Dissertation requirement. To receive transfer credit, students must submit an official copy of their prior transcript to the Program Director. For individual course transfers, the student must also provide a catalog description of the courses to be transferred. Official transcripts submitted for the student's admission application can be used for transfer credit evaluation.

Dissertation Adviser and Academic Adviser

Many factors enter into a student's choice for an adviser for their research. In addition to the scientific, intellectual and personality factors which influence the pairing of student and professor, financial aspects must also be considered. For most full-time students, the ideal situation is to find an adviser who has a research topic of mutual interest, as well as funds available from research grants and contracts which can support the student as a Research Assistant (RA). A prospective student is encouraged to contact faculty members in their research area regarding the possibility of advising them, before applying to the PhD program. A student who joins the PhD program without securing a thesis adviser will be assigned an academic adviser, who will guide the student in terms of course selection and research activities before the qualifying exam. Each student must obtain the commitment of a faculty member, in the student's chosen area of research interest, to be their thesis adviser before taking the qualifying exam.

Usually, the thesis adviser is a full-time faculty member in the Electrical and Computer Engineering Department, and, as such, is considered chair of the student's Guidance Committee. If a student wishes to have someone outside the ECE department serve as their adviser, the student should submit that person's CV and a letter of commitment from the person to the Program Director for approval. The thesis adviser must have a PhD degree in the student's proposed area of research.

Qualifying Exam

Each student must pass the Qualifying Exam (QE) within 2 years of entering the PhD program. The QE is an oral exam as described below. The student must have completed certain course and project requirements before taking the exam. Results of the exam will be recorded in the student's transcript as the 0-credit course: RE-GY 9990 PHD QUALIFYING EXAM.

Pre-Qualifying Exam Requirements

1. The student must have been enrolled at NYU Tandon for at least one semester and taken at least 3 graduate-level courses; and the student's cumulative GPA from formal courses (not including MS Thesis, independent studies, projects, internships, and readings) must be 3.5 or higher.
2. The student must have completed at least 2 core courses (see above chart) with a core GPA of 3.5 or higher, and a grade of B or better in each individual core course.
3. The student must have completed a research project under the supervision of a project adviser. The adviser can be any faculty member associated with ECE department. An external researcher may serve in this role, subject to approval by the chair of the ECE Graduate Curriculum and Standards Committee (to be referred to as the Graduate Committee subsequently). Examples of the project include, but are not limited to, an in-depth literature review of a certain topic, demonstrating solid understanding of a certain set of papers, or implementation and validation of some algorithms in past literature, or a study based on ideas initiated by the adviser or the student. Publication is not a requirement, but is encouraged if the student and the adviser find the contributions by the student worthy of publication. The project adviser should ensure that the project topic is appropriate for evaluating the student's potential for PhD research. It is the student's responsibility to identify and secure a project adviser.
4. The student must secure an ECE faculty member (or an external member approved by the Chair of the Graduate Committee) prior to taking the qualifying exam, This faculty member will serve as the student's PhD adviser, if the student passes the exam. The project adviser (from requirement 3 above) does not have to be the PhD adviser. The prospective PhD adviser is not obligated to provide financial support for the student. The adviser's letter of support must state a commitment of advising should the student pass the exam. It may also contain a narrative summarizing the student's progress in the program.

Taking the Qualifying Exam

1. The qualifying exam committee should include the prospective PhD adviser and three other faculty members chosen by the student in consultation with the PhD adviser. The committee should have at least three Tandon ECE tenure or tenure track (T/TT) faculty (including adviser). The fourth member can be a faculty member or an industry/research professor (with a PhD in Electrical Engineering or a related field) from NYU Abu Dhabi, NYU Shanghai, or any other NYU campus. At most, one member may attend the exam remotely, if the member is at NYU Abu Dhabi or NYU Shanghai. The student is responsible for securing the committee members to attend the qualifying exam, and for arranging a time at which all committee members can attend. The exam should be scheduled for 1.5 hours to allow sufficient time for questions and answers and final discussion among the committee members. Once the schedule has been arranged, the adviser should announce the exam to all ECE faculty and invite them to attend the exam.
2. A student must send in an official application, along with other required material, for taking the qualifying exam to the PhD qualifying exam coordinator, at least two weeks before the target date of the exam. The application form can be downloaded from the ECE Department's Student Resources page (https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources/).

3. The student must submit a written project report to the exam committee at least one week before the exam date. The written report should be self-contained, and follows the standard format of a conference paper. It is recommended that the report size is between 4 - 6 pages in double column, font size 11.
4. During the exam, the student will give a 30-minute project presentation, then take questions from the committee members. The questions will cover both the topic areas of the project and the foundational knowledge in the student's chosen area of research. Each committee member (excluding the adviser) is expected to engage in about 15 minutes of questions and answers with the student, with a total of 45 minutes for questions and answers. The student may ask each committee member from which area will they ask fundamental questions; however, the faculty member is not obliged to provide a detailed answer.
5. The committee will provide a written evaluation of the student's potential for PhD research to the department. The committee members can seek input from the prospective PhD adviser when making their evaluation, but the adviser is excluded from participating in voting and writing the evaluation report. The evaluation criteria can be found on the *PhD Qualifying Exam Evaluation Form* posted on the ECE Department's Student Resources page (https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources/).
6. The ECE department will make the final decision of pass or fail based on the exam committee's recommendation.
7. Result (pass or fail) of the qualifying exam will be recorded in the student's transcript as the course: RE-GY 9990 PHD QUALIFYING EXAM
8. The student should prepare their report and presentation independently, without help from their adviser.
9. If a student wants to present a work described in a published, accepted or submitted paper of which the student is not the sole author, the student should submit a short report (2 pages) that is an extensive summary of the work, or a literature survey of the area, and their future work, written by the student only, to be submitted along with the paper.
10. The student can present a work that has been presented at a conference, but the presentation should be modified as necessary to fit the qualifying exam's oral presentation time limit, and provide sufficient background material. The modification should be done by the student independently, without help from the adviser.

Qualifying Exam Deadline and Repeat Qualifying Exams

1. Students must pass the qualifying exam within 2 academic years of starting the PhD program, or they will be dismissed from the PhD program. The academic year begins at the start of the fall semester and concludes at the end of the spring semester.
2. First Exam: For students (both full-time and part-time) who started the PhD program with a prior MS degree in electrical engineering or a related area, the qualifying exam should be taken no later than one academic year after starting in the PhD program. For students (both full-time and part-time) who started the PhD program without a prior MS degree, the qualifying exam can be taken either in the first year or the second year but the max of 2 years to pass the QE still applies. If a student does not meet the requirement for taking the exam by the 2-year deadline, the student will be disqualified from the program.
3. Repeating the Qualifying Exam and Disqualification: Students who fail the QE but otherwise successfully meet the requirement for taking the QE can repeat the exam once. The second attempt should be made within one year after the first exam. Students who fail to pass the QE on the second attempt will be disqualified from the program.
4. The QE should be scheduled before a semester starts so that the student will be informed of the exam result on time for his or her course planning. A student who needs to repeat the QE cannot repeat the exam in the same semester and must wait at least three months from the time when the first exam was taken.
5. When a student is found to be deficient only in one part of the exam (e.g. written report, presentation of the project, answering fundamental questions), the student may be asked to repeat just that part of the exam. The repeat of a portion of the exam is treated the same as the repeat of the whole QE and is subject to the same deadlines.

Guidance Committee

Upon passing the qualifying exam, students should consult with their PhD adviser to identify additional members and form a guidance committee. This committee should be composed of at least three members with the PhD adviser usually acting as Chairperson. If the PhD adviser is not a tenured or tenure track (T/TT) Tandon faculty member of the ECE Department, then a T/TT Tandon faculty member of the ECE Department in the student's area of research must be invited to serve as the Committee Chair. The committee should include at least two ECE T/TT faculty (including the PhD adviser), and may include, at most, two external members from outside the Department, who have expertise in the student's area of research. Students must submit the names of the members of their Guidance Committee to the Office of Graduate Academics with a copy to the ECE Graduate Office within 6 months of passing the qualifying exam. The Guidance Committee conducts the area examination and dissertation defense, and approves the final dissertation draft. The Guidance Committee appointment form can be obtained from the Office of Graduate Academics (https://engineering.nyu.edu/academics/graduate/graduate-student-forms/).

Area Examination

In the area exam, students review prior research on their chosen dissertation topic and present preliminary research results and an additional research plan. The area exam is conducted by the Guidance Committee, but may be open to other interested faculty and students. The Guidance Committee attends and evaluates the student's performance and determines whether the student demonstrates the depth of knowledge and understanding necessary to carry out research in the chosen area. Results of the exam will be recorded in the student's transcript as ECE-GY 9980 Electrical Engineering Area Exam.

Students must submit a written report that summarizes prior research and the future plan at least one week before the scheduled exam time. The report should follow the PhD dissertation template and be at least 25 pages long. The student must take and pass the area exam within 2 years after passing the qualifying exam. Students who fail to pass the exam by the deadline will be disqualified from the program.

The *PhD Area Exam Evaluation Form* provides further details on the evaluation criteria. This form can be found on the ECE Department's Student Resources page (https://engineering.nyu.edu/academics/departments/electrical-and-computer-engineering/student-resources/).

Publication Requirement

PhD candidates must either have a peer-reviewed journal paper (accepted or published), or have at least one paper under review by a peer-reviewed journal on the dissertation research subject.

For the journal paper(s), a letter of acceptance by a journal, or a letter of submission to a peer-reviewed journal along with acknowledgment of its receipt by the journal, will constitute the required evidence. If there is no accepted/published journal paper, the student should have at least one accepted conference paper that appeared in the proceedings of a peer-reviewed conference.

Dissertation Defense

Upon completion of the doctoral dissertation, the student undergoes an oral dissertation defense. The defense is conducted by the Guidance Committee, but is open to all members of the ECE faculty and other invited people. The student must submit a complete draft of the dissertation to the Guidance Committee members at least one week before the scheduled defense. The student should consult the Office of Graduate Academics (https://engineering.nyu.edu/academics/graduate/graduate-student-forms/) regarding how to submit, reproduce and bind the final manuscript.

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
ECE Core		3
ECE Elective		3
Non-ECE Elective		3
ECE-GY 9900	Seminar in Electrical and Computer Engineering	0
	Credits	**9**
2nd Semester/Term		
ECE Core		3
Non-ECE Elective		3
Flexible Course		3
ECE-GY 9900	Seminar in Electrical and Computer Engineering	0
	Credits	**9**
3rd Semester/Term		
ECE Core		3
Flexible Course		3
Free Elective		3
ECE-GY 9900	Seminar in Electrical and Computer Engineering	0
	Credits	**9**
4th Semester/Term		
ECE Core		3
Flexible Course		3
Free Elective		3
ECE-GY 9900	Seminar in Electrical and Computer Engineering	0
	Credits	**9**
5th Semester/Term		
RE-GY 9990	PHD QUALIFYING EXAM [1]	0
	Credits	**0**
6th Semester/Term		
GA-GY 9993	Writing and Communication for Engineers and Scientists	3
Free Elective		3
Free Elective		3
	Credits	**9**
7th Semester/Term		
ECE-GY 999X	PhD Dissertation in Electrical Engineering Dept	3
Free Elective		3
ECE-GY 9980	Electrical Engineering Area Exam	0
	Credits	**6**
8th Semester/Term		
ECE-GY 999X	PhD Dissertation in Electrical Engineering Dept	3
Free Elective		3
	Credits	**6**
9th Semester/Term		
ECE-GY 999X	PhD Dissertation in Electrical Engineering Dept	3
Free Elective		3
	Credits	**6**
10th Semester/Term		
ECE-GY 999X	PhD Dissertation in Electrical Engineering Dept	3
Free Elective		3
	Credits	**6**
11th Semester/Term		
ECE-GY 999X	PhD Dissertation in Electrical Engineering Dept	6
	Credits	**6**
	Total Credits	**75**

[1] RE-GY 9990 PHD QUALIFYING EXAM is the prerequisite for GA-GY 9993 Writing and Communication for Engineers and Scientists and ECE-GY 999X PhD Dissertation in Electrical Engineering Dept. This course is often taken in the Summer of the second term.

Learning Outcomes

Upon successful completion of the program, graduates will:

1. Be prepared for a research career in electrical engineering and/or university-level teaching.
2. Gain strong fundamental knowledge in several electrical engineering disciplines, skills for independent research in a subdiscipline and the ability to prepare and defend a dissertation representing an original and significant contribution for publication in a recognized scientific or engineering journal.
3. Have acquired breadth and depth across a number of electrical engineering subdisciplines.

Policies

NYU Policies

University-wide policies can be found on the New York University Policy pages (https://bulletins.nyu.edu/nyu/policies/).

Tandon Policies

Additional academic policies can be found on the Tandon academic policy page (https://bulletins.nyu.edu/graduate/engineering/academic-policies/).