



Department of Electrical and Computer Engineering

# **GRADUATE STUDENT HANDBOOK**

August 28, 2025

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*This handbook is subject to amendments by the ECE Graduate Program Office at any time. While students will be informed when an updated version of the handbook is available, it is the student's responsibility to make sure they are referring to the most recent version of the handbook for policies and procedures.*

*Any questions not covered in this handbook may be addressed to the ECE Graduate Program Coordinator, Electrical Engineering Building, Room 134A, Busch Campus, (848) 445-2577 ([ECEGradProgram@soe.rutgers.edu](mailto:ECEGradProgram@soe.rutgers.edu)), or to the ECE Graduate Director, Electrical Engineering Building, Room 134B, Busch Campus, (848) 445-2577 ([ECEGradDirector@soe.rutgers.edu](mailto:ECEGradDirector@soe.rutgers.edu)). Formal consultations with the ECE Graduate Director are done during the weekly office hours and via email, while the Rutgers ECE Discord Server and Rutgers ECE Slack Workspace can be used for any informal discussions.*

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# 1. INTRODUCTION

The faculty and students of the graduate program in the Department of Electrical and Computer Engineering (ECE) are broadly divided into the following **specialization areas**:

- Communications
- Networking
- Signal and Information Processing
- Computational Sensing
- Machine Learning
- Systems and Controls
- Computer Engineering
- Software Engineering
- Cybersecurity
- Electronic Devices, Circuits and Systems

While the above categorizations provide a general framework, the actual research and teaching activities of faculty and students might intersect with several areas. The ECE Graduate Program offers **MS and PhD degrees** in many of these specialization areas. However, only PhD degrees are available in Networking, Computational Sensing, and Cybersecurity. Besides these degrees, the program facilitates non-degree enrollment where students can pursue **graduate certificates**, equipping them with specialized skills and knowledge tailored to industry needs and emerging technologies, or opt to be general **non-degree (non-matriculated) students**.

This handbook provides guidelines on the admission processes for the MS, Rutgers combined BS/MS, PhD, and Graduate Certificate programs within the department. It also details the requirements for the MS, BS/MS, and PhD degrees across the various specialization areas, as well as the requirements for the different Graduate Certificate programs. Furthermore, it offers insight into departmental policies concerning issues like credit transfers, academic standing, registration, for-credit internships, and practical training exclusively for international students, in addition to provisions for a reduced credit load for these students.

Note that students in the graduate program must also adhere to the policies of the **Rutgers School of Graduate Studies (SGS)**. For additional information regarding the general policies and procedures of the SGS, please consult its website at <https://grad.rutgers.edu>. Additionally, all immigration matters pertaining to international students are managed by **Rutgers Global**. For specific policies and procedures related to international students, refer to the Rutgers Global website at <https://global.rutgers.edu>.

**Lead-time for Processing of Student Requests:** The expansive nature of the ECE Graduate Program, encompassing a large student body and a diverse array of faculty research areas, underscores the necessity for fair and systematic processing for all student documents and applications. With this in mind, the Graduate Program Office insists that **students provide their forms at least three weeks prior to any given deadline**. While the office commits to accommodating unforeseen emergencies that demand swift processing, students should recognize that many crucial deadlines, such as those for graduation, I-20 expiration, visa renewals, and others, are announced well in advance. Therefore, it is imperative for students to plan ahead. Additionally, when seeking enrollment verification or documentation pertaining to employment opportunities, such as support letters, a **three-week advance submission** is strictly required.

**Kickstarting Your Graduate Journey:** As you embark on your graduate studies, it is crucial in your first semester to acquaint yourself with the faculty. This will help you identify a potential (research) advisor for your MS thesis, technical paper, or PhD dissertation. Forming strong connections with faculty is pivotal

for your academic journey and future endeavors. A constructive approach for the initial semester is to hone in on a specific area of interest. Once determined, initiate meetings with potential advisors who resonate with your chosen specialization and can guide you through your MS or PhD endeavors.

**Communication Responsibilities for Graduate Students:** All ECE graduate students are provided with Rutgers email addresses, which serve as the primary channel for official communications. Due to additional roles, such as Teaching Assistants or Graduate Assistants, students might possess multiple Rutgers email accounts. To ensure no communication is missed, students should either set up forwarding to a primary email or consistently check all accounts. *Not reading an essential email does not exempt a student from adhering to program requirements or deadlines.* It is also imperative to promptly update the ECE Graduate Program, School of Graduate Studies, and Rutgers University–New Brunswick of any changes in contact details.

## 2. ADMISSION REQUIREMENTS

The ECE Graduate Program welcomes applications from prospective students seeking admission into our degree programs, which comprise the MS, Rutgers combined BS/MS, and PhD degrees. Additionally, we offer entry into non-degree programs, where students can enroll either as graduate certificate candidates or as general non-degree (non-matriculated) students.

The program accepts students for both fall and spring semesters. To find application deadlines for the MS, BS/MS, PhD degree programs, graduate certificate programs, and non-matriculated students, visit the **ECE graduate admissions website:** <https://www.ece.rutgers.edu/admissions/graduate>. This website also provides links to the online admissions application portal.

**Admission decisions are made on a rolling basis for applications submitted by the stipulated deadlines.** Due to the highly competitive nature of the MS and PhD admission processes, some candidates, despite meeting or surpassing the minimum requirements, may not secure admission. Recommendations for admission come from the Electrical and Computer Engineering Graduate Admissions Committee, but final approval lies with the School of Graduate Studies. Prospective candidates for both the MS and PhD degrees must specify at least one specialization area of graduate study, as outlined in Section [1. Introduction](#), in both their online application and accompanying materials (personal statement and resume).

US Citizens or Permanent Residents can opt for either **full-time** (a minimum of 9 credits per semester) or **part-time** student status. In contrast, international students must maintain a full-time student status. Part-time students, however, remain subject to the same admission and degree / program requirements as their full-time counterparts.

While the **GRE** is not mandatory for admission into the graduate program, foreign applicants whose primary language is not English must submit **TOEFL, IELTS, or DET** scores. An exception can be granted if an applicant has completed a minimum of three years of undergraduate studies or has earned a master's degree taught in English. Applicants seeking such exceptions should first submit their application through the admissions portal. Subsequently, they are advised to reach out directly to the ECE Graduate Program Coordinator ([ECEGradProgram@soe.rutgers.edu](mailto:ECEGradProgram@soe.rutgers.edu)) to request the granting of the exception. The TOEFL / IELTS test scores must be no older than two years from the semester of application. The suggested minimum scores are: TOEFL iBT - Reading: 21, Listening: 17, Speaking: 23, Writing: 22; IELTS overall band score: 7. Applicants with scores below these thresholds may still be considered for admission on an individual basis, but some might be required to enroll in English remedial courses at the Rutgers English Language Institute (<https://reli.rutgers.edu>).

## 2.1. MS Program

To be considered for admission into the master's degree program, applicants must provide:

- A bachelor's degree in Electrical and/or Computer Engineering or a similar program, accompanied by relevant transcripts.
- A personal statement.
- A curriculum vitae.
- Three letters of recommendation.

Although **the program does not stipulate a minimum grade point average (GPA) requirement**, applicants with any inconsistencies or concerns in their academic records should address these in their personal statement. Additionally, they should ensure that their recommendation letters provide compelling evidence of their capability to succeed in the demanding environment of the Rutgers ECE MS program. Moreover, while the program welcomes applicants from related fields such as Physics, Computer Science, Applied Mathematics, and other non-ECE Engineering and Technology disciplines, it is essential that application materials demonstrate the applicant's readiness and competence for the rigor of the program.

## 2.2. Rutgers Combined BS/MS Program

The Rutgers combined BS/MS program offers a streamlined pathway for current undergraduate students to obtain an accelerated MS degree. Compared to external graduate school applications, the transition to the Rutgers ECE Graduate Program is significantly simplified for those already pursuing their bachelor's at Rutgers–New Brunswick. *These students benefit from waived admission application fees, no need for a personal statement, and potential exemptions from obtaining recommendation letters based on their GPA.* The BS/MS graduate application process comprises three steps:

- **Application Access:** Students currently enrolled in a Rutgers–New Brunswick BS program should visit <https://go.rutgers.edu/applynow> and log in using their NetID.
- **Application Start:** Begin the application by selecting the following options:
  - *Applicant Type:* “Degree”
  - *Degree Type:* “5-Years Master's”
  - *Area of Study:* “Engineering”
  - *Location/Instructional Method:* “New Brunswick”
  - *Program Selection:* “Electrical and Computer Engineering – 5 Year (MS) New Brunswick”
  - *Term:* Choose the term when you plan to begin your MS program, ensuring all BS requirements are completed, and the BS degree is obtained before the start of the MS program.
- **Application Submission:** Complete all sections of the application and submit it. No admission application fee is required.

**Letters of Recommendation:** Letters of recommendation are not required for the majority of BS/MS applicants. However, if they are needed, the Graduate Program Office will explicitly contact the applicant with instructions for recommenders to submit their letters to [ECEGradProgram@soe.rutgers.edu](mailto:ECEGradProgram@soe.rutgers.edu). Whether letters of recommendation will be requested from a BS/MS applicant is based on the following criteria:

- **GPA > 3.7:** Students with a GPA above 3.7 may qualify for Teaching Assistant (TA) or Fellowship support by securing two (2) recommendation letters. The Graduate Program Office will contact eligible students within a few weeks of application submission with further instructions.
- **GPA between 3.2 and 3.7:** No recommendation letters are required; however, students in this range will not be eligible for TA/GA support.

- **GPA between 3.0 and 3.2:** One (1) strong recommendation letter from a Rutgers faculty member is required. The Graduate Program Office will provide instructions to students in this category within a few weeks after application submission.
- **GPA between 2.8 and 3.0:** Two (2) strong recommendations from Rutgers faculty are required. The Graduate Program Office will contact applicants in this category with further instructions within a few weeks of application submission.

**A note on minimum GPA requirements for BS/MS admissions:** Admission to the MS program is unlikely for students with a GPA below 2.8. However, if you believe you have a strong case for admission and can explain the low GPA due to extenuating circumstances, please discuss this with the Graduate Program Director before applying.

### **Important Dates:**

Mid-November of the senior year marks the commencement of the application process.

Admission decisions are initially made by the end of January of the senior year.

Continuous reviews based on achieved grades span from January through August of the senior year.

## **2.3. PhD Program**

To be considered for admission into the doctoral degree program, applicants must provide:

- A bachelor's or master's degree in Electrical and/or Computer Engineering or a comparable program, accompanied by relevant transcripts.
- A statement of purpose detailing the applicant's research interests, aspirations, and motivation for pursuing a PhD in Electrical and Computer Engineering at Rutgers University. This should include past research experiences, key achievements, methodologies employed, and how these experiences align with their future research ambitions. Additionally, applicants are encouraged to discuss any faculty members at Rutgers ECE with whom they are interested in working and how their research areas converge.
- A curriculum vitae highlighting research experiences, publications, and other relevant achievements.
- Three or more letters of recommendation, with at least one coming from a faculty member or research advisor familiar with the applicant's research capabilities. Evidence of potential for original research contributions can be demonstrated through these letters.

Applicants who may have inconsistencies in their academic record due to extenuating circumstances, such as severe personal or financial hardships or forced displacement, are still encouraged to apply. They should detail these situations in their personal statement and provide evidence, ideally through their letters of recommendation, of their capacity to excel in the demanding environment of the Rutgers ECE PhD program. Candidates with bachelor's and/or master's degrees from closely related areas such as Physics, Computer Science, Applied Mathematics, and other non-ECE Engineering and Technology disciplines are eligible. Their application materials should underscore their aptitude and readiness for high-level research and rigorous coursework in Electrical and Computer Engineering.

**Continuing from MS to PhD at Rutgers:** Students who have completed the MS degree requirements at Rutgers and wish to continue to the PhD program must have a minimum cumulative GPA of 3.5, a commitment from a Rutgers ECE faculty member to serve as their PhD advisor, and should submit a [change of status form](#) to the ECE Graduate Program Office ([ECEGradProgram@soe.rutgers.edu](mailto:ECEGradProgram@soe.rutgers.edu)) for approval.

## 2.4. Graduate Certificate Programs

The ECE Graduate Program offers graduate certificates in three specialized domains:

- Cybersecurity
- Machine Learning
- Socially Cognizant Robotics

Both the Cybersecurity and Machine Learning certificates are open to a wide range of applicants, including current Rutgers graduate students, whether they are non-degree students, MS, or PhD candidates. Additionally, US Citizens, Permanent Residents, and international candidates not currently enrolled at Rutgers are also welcome to apply. Conversely, the Socially Cognizant Robotics certificate is reserved exclusively for current graduate students at Rutgers University.

For a detailed overview of the admission processes, curriculum details, and other specifics related to these certificate programs, prospective students should visit the website of the Rutgers ECE Graduate Certificate Programs at <https://www.ece.rutgers.edu/graduate-certificate-programs>.

## 2.5. Non-Degree Students

US Citizens or Permanent Residents with the requisite qualifications can seek admission to the ECE Graduate Program as non-matriculated (non-degree) students. *This non-degree program often serves as a “Bridge Program” for students with a weak background in ECE, allowing them to strengthen their qualifications for eventual transition into the MS degree program.* These applicants must have academic credentials comparable to those required for regular admission and should provide relevant transcripts as evidence. For an understanding of the admission processes and other details, please visit the ECE graduate admissions website (<https://www.ece.rutgers.edu/admissions/graduate>), which also provides a link to the online admissions application.

After successfully completing 12 graduate credits with a minimum grade of B in each, non-degree students may apply to transition to matriculated (degree) status. Importantly, a maximum of 12 credits can be undertaken as a non-degree student.

The admission criteria for non-matriculated students transitioning to regular degree programs align with those for standard degree students. For further details and clarifications, prospective students can reach out to the ECE Graduate Program Coordinator ([ECEGradProgram@soe.rutgers.edu](mailto:ECEGradProgram@soe.rutgers.edu)).

## 3. MS DEGREE REQUIREMENTS

Master of Science degree candidates can opt for either a thesis-based or a non-thesis program of study.

- **Thesis Option:** Under this option, candidates are required to complete 24 credits of coursework, maintaining a **minimum grade point average (GPA) of 3.0**. Additionally, they must undertake 6 credits of research culminating in a master’s thesis (refer to Section [3.3. Master’s Thesis](#)) and successfully defend the thesis.
- **Non-thesis Option:** For this program, candidates need to complete 30 credits of coursework while achieving a **minimum GPA of 3.0**. They are also required to author a Technical Paper (refer to Section [3.4. MS Technical Paper](#)), which must receive approval from at least three members of the ECE Graduate Faculty (see Appendix [A.1. ECE Graduate Faculty](#)).

### 3.1. Special Provisions for BS/MS Combined Program

Students enrolled in the combined BS/MS program have distinct initial requirements due to the integrated nature of their study program. After satisfying these specific conditions, BS/MS students must also adhere to the general MS program requirements presented in subsequent sections. BS/MS students should also consult [Appendix F — Additional Guidelines for BS/MS Combined Program](#) for extended guidance on their unique academic pathway. The distinct conditions and requirements for students in the combined BS/MS program include:

- **MS Credit Requirements:** The overall credit requirements for the MS degree for BS/MS students are identical to those for regular Electrical and Computer Engineering MS students, including:
  - Thesis option: 24 credits of coursework, 6 credits of Research in ECE, plus the master’s thesis.
  - Non-thesis option: 30 credits of coursework plus the master’s technical paper.
- **Completion of BS Degree and Permission for Graduate Courses:** Students admitted into the BS/MS program may begin taking graduate courses while completing their BS degree requirements. However, they must complete their BS degree and obtain the degree before being formally recognized as MS students. *Additionally, students must complete at least nine (9) graduate course credits after transitioning to the MS program.* This means that while enrolled as BS students, they are allowed to take graduate courses, but they cannot complete all 30 MS credits prior to earning their BS degree. If students wish to enroll in graduate courses before completing their BS degree, they must obtain permission from the Graduate Program Office ([ECEGradProgram@soe.rutgers.edu](mailto:ECEGradProgram@soe.rutgers.edu)).
- **Utilizing Undergraduate Credits for MS Degree:** BS/MS students are eligible to use up to a maximum of 12 undergraduate credits towards their 30 MS credits. The eligible undergraduate credits are those that have not been used towards their undergraduate degree (including for the residency requirement) and must appear as “unused” credits within the Degree Navigator. *Note that not all undergraduate courses are eligible to be counted towards the MS degree, even if they appear unused in the Degree Navigator.* All BS/MS students are encouraged to reach out to the Graduate Program Office for planning for transfer courses to avoid surprises. General guidelines for eligible courses can be found in [Appendix F — Additional Guidelines for BS/MS Combined Program](#). The credit transfer process is detailed in Section [7. Transfer of Credits](#).

### 3.2. Course Requirements

The course requirements for MS students in the ECE program encompass a chosen specialization area, mandatory colloquium attendance, a structured selection of coursework including core and elective courses, and meeting the ECE residency requirements.

**Specialization Area:** All MS students must declare their intent to specialize in one of the areas outlined in Section [1. Introduction](#). **Cross-cutting specializations** are also highly encouraged; students with interests spanning multiple specialization areas should consult with their thesis advisor (if applicable) and the Graduate Director to create a coherent study plan. Formal approval from the Graduate Program Office is required *before* registering for the proposed cross-disciplinary specialization coursework.

**Colloquium (0 credit):** MS students must complete **two (2) semesters** of 16:332:699—Colloquium in Electrical and Computer Engineering. To secure credit for 16:332:699 (Colloquium in ECE), students must be formally enrolled and attend a **minimum of eight seminars**, deriving from both the ECE Colloquium and the ECE Guest Speaker Series. If the total number of seminars from the Guest Speaker Series and the ECE Colloquium is less than eight in a semester, credit is given for attending the available ones. Additionally, the ECE Colloquium sessions must constitute at least six, or fewer if available, out of these eight seminars, all of which are held at the regular times listed for the semester. For the seminars in the

Guest Speaker Series, which can occur on any given day of the week, students are required to download, print, and complete the Guest Speaker Series attendance form available on the ECE website. This form must be endorsed by the faculty member who hosted the seminar. Upon completion, students should submit this signed form to Colloquium Canvas site.

**Coursework:** The coursework for the MS program in each specialization area has been divided into *three* categories: (1) **core courses**, (2) **restricted elective courses**, and (3) **general elective courses**.

- **General Policy:** For details on core and elective courses for each specialization area, students should refer to [Appendix B — MS Core/Elective Courses by Specialization Area](#), where they will find both the course lists and specific requirements. Since these requirements may vary by area, careful consultation of the appendix is advised. Except for those pursuing an approved cross-disciplinary specialization, students must adhere to the respective core and elective courses designated for each specialization area as outlined in Appendix B.
- **Core Courses:** Students are generally required to take *at least 3 courses* from the list of core courses for their chosen specialization. Any variations or special conditions for specific areas are detailed in Appendix B.
- **Restricted Elective Courses:** A *minimum of 3 courses* from the list of restricted elective courses must be chosen for the respective specialization. Specific conditions or variations for particular areas can be found in Appendix B.
- **General Elective Courses:** Unless specified for a particular specialization in Appendix B, students may choose general elective courses from any Rutgers graduate course, including those offered by other departments, *provided they are relevant to electrical and computer engineering*.
- **Substitutions:** If students wish to replace one or more core and/or elective courses within their specialization area with an unlisted course, they may petition the Graduate Program Office. Such petitions must include a rationale for the replacement and, if applicable, endorsement from the student's thesis advisor.

**ECE Residency Requirement:** While the curriculum for Electrical and Computer Engineering (ECE) allows for the inclusion of courses outside the department (such as mathematics), it also mandates that students must satisfy a “residency requirement” to obtain an ECE degree. This requirement ensures that students earn a specific number of credits from courses bearing ECE course numbers. Specifically:

- **Thesis Option:** Students must accumulate *at least 15 residency credits*. This can include ECE graduate courses listed in the core and elective courses for those focusing on one of the specialization areas, as well as relevant ECE graduate courses for those focusing on cross-disciplinary specializations. Please note that the 6 credits of thesis work from 16:332:701 and 16:332:702 do not count towards core or elective listings.
- **Non-Thesis Option:** A *minimum of 21 residency credits* is required, following the same guidelines as the thesis option.

By adhering to these residency requirements, students can ensure that their coursework is grounded in the foundational areas of Electrical and Computer Engineering, even as they explore related disciplines.

**General Policy for Online Courses:** In pursuit of the MS degree in ECE, students must adhere to specific guidelines regarding online courses. Specifically, online courses taken outside of the ECE department, as well as short courses (e.g., winter break, spring break, two-week courses), are not eligible to satisfy the MS degree course requirements. Up to four online courses offered by Rutgers University's ECE department may be counted, comprising up to 12 credits towards the MS degree course requirements.

**Exception to the Online Course Policy (COVID-19 Pandemic):** An exception to this general policy has been made for specific semesters impacted by the COVID-19 pandemic. Specifically, online ECE graduate courses (or other approved program courses) taken during Spring 2020, Fall 2020, Spring 2021, Fall 2021, and Spring 2022 may be counted towards the MS degree course requirements. This temporary adjustment acknowledges the unique challenges and changes in course delivery during these semesters.

### 3.3. Master's Thesis

Students choosing the thesis option must secure a thesis advisor who will guide and supervise their research project. The thesis advisor is not appointed by the department but rather chosen by the student in alignment with their research interests and needs. In consultation with the ECE Graduate Director, a **thesis committee** will be formed, consisting of *at least three members*, including the thesis advisor who will serve as the chair. All members of the thesis committee must be members or associate members of the graduate faculty of the ECE Graduate Program (see Appendix [A.1. ECE Graduate Faculty](#)). One additional non-program member is permitted if appropriate but must be approved by the ECE Graduate Director. Substitutions in the committee membership may be made only by the ECE Graduate Director, either when a member is unable to serve or when a change in the student's thesis topic requires modification of the committee.

The thesis defense must be announced and is open to the public. Virtual participation, such as via Zoom, is permitted upon the agreement among all the committee members.

A final draft of the thesis, complete with all figures and references, must be provided to all committee members and the ECE Graduate Program Office *at least three weeks* before the thesis defense date. The thesis must adhere to the Rutgers School of Graduate Studies (SGS) **style specifications**, as provided on the SGS website at <https://grad.rutgers.edu/academics/graduation>. The thesis must be approved by the thesis advisor and accepted by the other members of the student's committee. After a successful defense, a final version of the thesis must be submitted to the ECE Graduate Program Office in electronic form, along with the degree candidacy form (refer to Section [3.7. Graduation Paperwork and Deadlines](#) and Section [3.8. Checklists for the MS Degree](#)).

If a student fails their final thesis defense examination, they will be allowed one more opportunity to rewrite and defend the thesis. Alternatively, at the recommendation of their committee, the student may switch to the non-thesis option, take additional courses to accumulate 30 credits, and write the MS Technical Paper. Failure to pass the repeated thesis examinations will result in a recommendation for dismissal from the ECE Graduate Program.

### 3.4. MS Technical Paper

The MS Technical Paper is a requirement for all students pursuing the non-thesis MS degree within the department, serving as a substitute for the Master Comprehensive Examination mandated by the Rutgers School of Graduate Studies (SGS).

**It is crucial for students selecting the non-thesis option to commence work on their MS Technical Paper early in their studies to circumvent unnecessary delays in graduation.** The selection of the Master Technical Paper's topic must occur in collaboration with an ECE graduate faculty member, who will act as the student's advisor for the technical paper. For the paper to be approved, it must be evaluated and accepted by **three ECE graduate faculty members**, including the student's advisor, who serves as the *Lead Reader, Faculty Evaluator, and Committee Chairperson* for the paper. Together with the advisor, the student chooses two additional ECE graduate faculty members to function as readers of the technical paper. The student is responsible for incorporating feedback from the readers, revising the paper as needed, and

securing the approval of all three readers prior to the MS candidacy form submission deadline. Each student is allocated two opportunities to successfully pass the evaluation of their technical paper.

One recommended strategy for producing a successful technical paper is to build upon work from course term papers, course projects, or research derived from Special Problems courses (also, refer to [Appendix E — Additional Guidelines for MS Technical Papers](#)). Typically, the course instructor in these scenarios becomes the advisor for the technical paper, while the student identifies two additional graduate faculty members to review the completed paper, following its approval by the course instructor or advisor.

*To avoid potential challenges in finding faculty members available for reading committee memberships, students are strongly urged to finalize the members of their technical paper reading committee no later than the third week of the semester in which they intend to graduate. Faculty members frequently become unable to accept new reading committee assignments later in the semester, making early planning essential.*

### 3.5. For-Credit Internships for MS Students

The for-credit internship program in the Department of Electrical and Computer Engineering is tailored to cater to MS students pursuing either the thesis or non-thesis option. By offering real-world experience that complements their academic studies, this program aims to bridge the gap between theory and practice. Students can apply their theoretical knowledge and technical skills in a professional setting while earning academic credit towards their degree. The educational experience provided by the internship is a key component that sets it apart from other internship programs, as it emphasizes the integration of academic learning and practical work experience.

Through these for-credit internships, MS students will be exposed to industry practices, cutting-edge technologies, and the latest trends in the field of electrical and computer engineering. They will have the opportunity to work on real-world projects, develop crucial problem-solving and teamwork abilities, and establish valuable connections with professionals in their area of interest. By participating in this program, students not only expand their professional network, but also improve their employment prospects upon graduation. In addition, the program enhances students' ability to reflect upon their learning and to articulate how their academic studies have contributed to their growth as professionals in the field. This comprehensive approach to combining academics and practical experience ensures that our students are better prepared for the challenges and opportunities that await them in their future careers.

#### 3.5.1. Requirements and Policies for For-Credit Internships

To maintain a streamlined and effective for-credit internship program, the ECE Graduate Program has established the following requirements and policies for participating students:

1. **Eligibility:** The program is available to MS students pursuing either the thesis or non-thesis option. Students enrolled in the BS/MS program are eligible to take credit as early as the first summer after their BS degree.
2. **Enrollment Status and GPA Requirement:** Students must be enrolled full-time in the MS program, have completed *at least two semesters of coursework* before applying for an internship (unless in the BS/MS program), and maintain a minimum cumulative grade point average (GPA) of 3.0.
3. **Internship Approval:** The internship must be related to the student's area of study, be full-time, and last at least 10 weeks in duration. It must be pre-approved by the ECE Graduate Program Office before the start of the internship following the approval process outlined in Appendix [G.1. For-Credit Internship Approval Process](#).

4. **Course Registration:** Students seeking to get credit must register for 1 to 3 credits of 16:332:601 or 16:332:602 (Special Problems) under a faculty who agrees to supervise the internship credits. For MS students pursuing the thesis option, this is typically the student's advisor. Students pursuing the non-thesis option often arrange to take these credits with the ECE Graduate Program Director. *Internship credits will count towards the general elective course requirements*, and it is the student's responsibility to be aware of how many credits of general elective courses they have left that can be applied towards an internship. *Please note that no more than 6 total internship credits will be given to an MS student.*
5. **Internship Report:** Upon completion of the internship, students must submit a technical report detailing their work experience, accomplishments, and how the internship contributed to their academic and professional growth. The report must be written as a technical report, complete with an abstract, introduction, and other relevant sections. It should adhere to academic standards, including properly cited bibliography, clearly captioned figures, and appropriately formatted mathematical equations where applicable. *The report must be at least 3,000 words in length and submitted within two weeks of completing the internship to the faculty supervising their internship credits.* The faculty supervising the internship must agree to provide an assessment of the report to the ECE Graduate Program Office. *For MS students pursuing the non-thesis option, the report can also be turned into the MS Technical Paper needed for final graduation.*
6. **Evaluation:** The faculty supervising the internship report will submit their assessment to the ECE Graduate Program Office. Additionally, the appraisal from the employer, either through the manager, the HR department, or any other authorized personnel within the internship company, must also be submitted to the ECE Graduate Program Office. *Both the faculty assessment and the employer appraisal must be submitted within four weeks of completing the internship.*

### 3.6. Typical Timelines for MS Students

Within the ECE Graduate Program, there are multiple paths to completing the master's degree. In this section, we outline example schedules for both the non-thesis and thesis options, along with some general guidelines to assist students in planning their academic journey. However, it is essential to recognize that these examples represent only a few among many viable approaches, and students are encouraged to explore alternative paths that align with their unique goals and interests. It is also worth noting that students enrolled in the accelerated BS/MS combined program will likely follow a different timeline, tailored to the more expedited nature of their studies.

#### Example Timeline for the Thesis Option: 3-Semester Plan

| Semester                      | Courses                                                                                                                                           | Guidelines                                                                                                                                    |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Year 1, Fall<br>(9 credits)   | 1. Core Course (3 credits)<br>2. Core Course (3 credits)<br>3. Restricted Elective Course (3 credits)<br>4. ECE Colloquium (0 credit)             | <ul style="list-style-type: none"> <li>• Declare specialization area</li> <li>• Contact faculty about research</li> </ul>                     |
| Year 1, Spring<br>(9 credits) | 1. Core Course (3 credits)<br>2. Restricted Elective Course (3 credits)<br>3. General Elective Course (3 credits)<br>4. ECE Colloquium (0 credit) | <ul style="list-style-type: none"> <li>• Register advisor with the ECE Graduate Program Office</li> <li>• Start work on the thesis</li> </ul> |
| Year 1, Summer<br>(3 credits) | 1. Research Elec Engg (3 credits)                                                                                                                 | <ul style="list-style-type: none"> <li>• Continue work on the thesis</li> </ul>                                                               |
| Year 2, Fall                  | 1. Restricted Elective Course (3 credits)                                                                                                         | <ul style="list-style-type: none"> <li>• Finalize thesis committee</li> </ul>                                                                 |

|             |                                                                             |                                                                                                |
|-------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| (9 credits) | 2. General Elective Course (3 credits)<br>3. Research Elec Engg (3 credits) | <ul style="list-style-type: none"> <li>Complete MS thesis</li> <li>Defend MS thesis</li> </ul> |
|-------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|

#### Example Timeline for the Thesis Option: 4-Semester Plan

| Semester                      | Courses                                                                                                                                           | Guidelines                                                                                                                                |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Year 1, Fall<br>(9 credits)   | 1. Core Course (3 credits)<br>2. Core Course (3 credits)<br>3. Restricted Elective Course (3 credits)<br>4. ECE Colloquium (0 credit)             | <ul style="list-style-type: none"> <li>Declare specialization area</li> <li>Contact faculty about research</li> </ul>                     |
| Year 1, Spring<br>(9 credits) | 1. Core Course (3 credits)<br>2. Restricted Elective Course (3 credits)<br>3. General Elective Course (3 credits)<br>4. ECE Colloquium (0 credit) | <ul style="list-style-type: none"> <li>Register advisor with the ECE Graduate Program Office</li> <li>Start work on the thesis</li> </ul> |
| Year 1, Summer                | Optional (not-for-credit) Internship                                                                                                              |                                                                                                                                           |
| Year 2, Fall<br>(9 credits)   | 1. Restricted Elective Course (3 credits)<br>2. General Elective Course (3 credits)<br>3. Research Elec Engg (3 credits)                          | <ul style="list-style-type: none"> <li>Continue work on the thesis</li> </ul>                                                             |
| Year 2, Spring<br>(3 credits) | 1. Research Elec Engg (3 credits)                                                                                                                 | <ul style="list-style-type: none"> <li>Finalize thesis committee</li> <li>Complete MS thesis</li> <li>Defend MS thesis</li> </ul>         |

#### Example Timeline for the Non-Thesis Option: 3-Semester Plan

| Semester                      | Courses                                                                                                                                           | Guidelines                                                                                                                        |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Year 1, Fall<br>(9 credits)   | 1. Core Course (3 credits)<br>2. Core Course (3 credits)<br>3. Restricted Elective Course (3 credits)<br>4. ECE Colloquium (0 credit)             | <ul style="list-style-type: none"> <li>Declare specialization area</li> </ul>                                                     |
| Year 1, Spring<br>(9 credits) | 1. Core Course (3 credits)<br>2. Restricted Elective Course (3 credits)<br>3. General Elective Course (3 credits)<br>4. ECE Colloquium (0 credit) | <ul style="list-style-type: none"> <li>Identify a course project that can satisfy the technical paper requirement</li> </ul>      |
| Year 1, Summer<br>(3 credits) | 1. For-Credit Internship (3 credits)                                                                                                              | <ul style="list-style-type: none"> <li>Complete the technical paper</li> <li>Contact faculty to review technical paper</li> </ul> |
| Year 2, Spring<br>(9 credits) | 1. Restricted Elective Course (3 credits)<br>2. General Elective Course (3 credits)<br>3. General Elective Course (3 credits)                     | <ul style="list-style-type: none"> <li>Submit technical paper and signed forms</li> </ul>                                         |

#### Example Timeline for the Non-Thesis Option: 4-Semester Plan

| Semester                    | Courses                                                                 | Guidelines                                                                    |
|-----------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Year 1, Fall<br>(6 credits) | 1. Core Course (3 credits)<br>2. Restricted Elective Course (3 credits) | <ul style="list-style-type: none"> <li>Declare specialization area</li> </ul> |

|                               |                                                                                                                                                   |                                                                                                                                   |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|                               | 3. ECE Colloquium (0 credit)                                                                                                                      |                                                                                                                                   |
| Year 1, Spring<br>(9 credits) | 1. Core Course (3 credits)<br>2. Restricted Elective Course (3 credits)<br>3. General Elective Course (3 credits)<br>4. ECE Colloquium (0 credit) | <ul style="list-style-type: none"> <li>Identify a course project that can satisfy the technical paper requirement</li> </ul>      |
| Year 1, Summer                | Optional (not-for-credit) Internship                                                                                                              |                                                                                                                                   |
| Year 2, Fall<br>(9 credits)   | 1. Core Course (3 credits)<br>2. Restricted Elective Course (3 credits)<br>3. General Elective Course (3 credits)                                 | <ul style="list-style-type: none"> <li>Complete the technical paper</li> <li>Contact faculty to review technical paper</li> </ul> |
| Year 2, Spring<br>(6 credits) | 1. General Elective Course (3 credits)<br>2. General Elective Course (3 credits)                                                                  | <ul style="list-style-type: none"> <li>Submit technical paper and signed forms</li> </ul>                                         |

These examples are illustrative of the flexibility in scheduling that the program offers, allowing students to choose a pace that best fits their individual needs and commitments. Please note that the actual course selection and planning should be done in consultation with an academic advisor and/or the ECE Graduate Director to ensure alignment with program requirements and individual career goals.

### 3.7. Graduation Paperwork and Deadlines

The Rutgers School of Graduate Studies (SGS) confers degrees at three distinct times throughout the academic year, corresponding to *January, May, and October degree dates*. Students can find the deadlines for each of these degree dates on the SGS website at <https://grad.rutgers.edu/academics/graduation>. Please note that it is the student's responsibility to stay informed about these deadlines.

To graduate with a Master of Science degree, students are required to complete and submit the *candidacy form* to the ECE Graduate Program Office, an essential component of the graduation procedure. The form is available from SGS at <https://grad.rutgers.edu/academics/forms> and can be downloaded from the ECE website at <https://www.ece.rutgers.edu/graduate-forms-information>. *Initially, this form should be presented to the ECE Graduate Program Office for verification of credits and grades.* Once approved, students need to gather signatures from their MS thesis or MS technical paper committee members and the ECE Graduate Director. Following this, the form should be forwarded to SGS by the specified deadline. For those pursuing the **Thesis Option**, ensure that the **thesis title page** is signed by the MS thesis committee members. This signed title page, along with the candidacy form, should then be provided to the Graduate Director for endorsement. Detailed guidelines for submitting the degree candidacy form to SGS are available on the form itself.

*As the ECE Graduate Program receives a large volume of requests around the time of graduation, it is crucial that students complete the Master of Science candidacy form several weeks before their anticipated graduation date. The ECE Graduate Program Office announces internal deadlines for graduation paperwork, typically a couple of weeks earlier than the SGS deadlines, for January, May, and October degree dates. This proactive approach ensures that all requirements are met in a timely manner.*

In addition to the candidacy form, students are required to complete the *diploma application* online on the SGS website. This process is another essential step in securing one's graduation status and must be completed by the indicated deadline.

### 3.8. Checklists for the MS Degree

The Rutgers School of Graduate Studies (SGS) website (<https://grad.rutgers.edu/academics/graduation>) provides detailed checklists for degree applications, catering to both the **MS with Thesis** and **MS without Thesis** options. For specifics related to your degree, please navigate to the **New Brunswick | Piscataway** section on the site. These comprehensive checklists cover aspects like the *diploma application*, *candidacy form*, *thesis title page* (where applicable), and the *electronic submission of the thesis* (if relevant), which can be done at <https://etd.libraries.rutgers.edu/submit-your-etd>. Moreover, for any inquiries about the final degree application process, the website offers contact details. If you have specific questions or need clarifications regarding the *candidacy form*—an integral part of the degree application—feel free to reach out to the ECE Graduate Program Office.

## 4. PHD DEGREE REQUIREMENTS

To obtain a PhD (doctoral) degree in the ECE department, students must navigate a set of distinct criteria. Central to the Rutgers ECE doctoral journey is an emphasis on rigorous research, culminating in a dissertation. This body of work undergoes rigorous evaluation and approval by specially selected faculty committees, as elaborated in Section [4.3. PhD Proposal Defense](#) and Section [4.4. PhD Dissertation Submission and Defense](#). Below, we outline these pivotal requirements, with comprehensive details following in subsequent sections.

- **Research Advisor:** Every PhD student must be under the guidance of a research advisor, who is a member of the graduate faculty of the ECE Graduate Program (see Appendix [A.1. ECE Graduate Faculty](#)). This advisor not only provides direction in the student's research journey but also chairs both the PhD Proposal and Dissertation Committees.
- **Specialization Area:** In coordination with their research advisor, every PhD student is required to select a specialization area for their studies. While specific specializations are provided in Section [1. Introduction](#), students are also encouraged to pursue interdisciplinary themes that intersect multiple areas. Those with such cross-cutting interests should seek guidance from their research advisor. Notably, the chosen specialization dictates the coursework prerequisites for the PhD Qualifying Examination.
- **Credit and Course Requirements:** To attain the PhD degree, students are required to complete a minimum of 72 credits while maintaining a grade point average (GPA) of at least 3.5. Of these credits, a minimum of 36 should come from graduate coursework and 24 should be attributed to dissertation research (course codes 16:332:701 and 16:332:702). The remaining 12 credits can be sourced from either further graduate coursework or dissertation research. Within the graduate coursework, students are required to select 5 courses from designated lists specific to each specialization. These courses serve as prerequisites for the PhD Qualifying Exam; see Section [4.1. Course Requirements](#) and Section [4.2. Becoming a PhD Candidate](#) for further details.
- **PhD Qualifying Examination:** This exam assesses a student's innovative capabilities, depth of knowledge, and readiness for independent research. Upon passing this exam and submitting the PhD Candidacy Form to the Rutgers School of Graduate Studies, a student gains the formal designation of a PhD Candidate, also known as a Post-Qualifying PhD Student. See Section [4.2. Becoming a PhD Candidate](#) for details.
- **PhD Proposal Defense:** After advancing to PhD candidacy, students are expected to draft a PhD Proposal typically one year before their anticipated graduation. This document details both their completed research and the planned trajectory for their dissertation. The proposal is then defended before the PhD Proposal Committee, which is chaired by the student's research advisor. See Section

[4.3. PhD Proposal Defense](#) for details.

- **PhD Dissertation Submission and Defense:** The culmination of the PhD program is the dissertation, commonly referred to as the PhD thesis. This document stands as the definitive archival record of the student's extensive research efforts. Before its final approval, each dissertation is subjected to rigorous scrutiny by the PhD Dissertation Committee, which is chaired by the student's research advisor. Moreover, every PhD student is mandated to publicly present their dissertation's findings in a session commonly known as the PhD Thesis Defense. During this defense, the dissertation committee evaluates the thoroughness and validity of the presented research. Detailed guidelines and expectations are outlined in Section [4.4. PhD Dissertation Submission and Defense](#).

## 4.1. Course Requirements

For PhD candidates in the ECE program, the course structure detailed below mandates colloquium attendance, specifies a 72-credit distribution between academic coursework and research endeavors, and prescribes mandatory coursework as a precursor to the PhD Qualifying Examination.

**Colloquium (0 credit):** PhD students must complete **four (4) semesters** of 16:332:699—Colloquium in Electrical and Computer Engineering. To secure credit for 16:332:699 (Colloquium in ECE), students must be formally enrolled and attend a **minimum of eight seminars**, deriving from both the ECE Colloquium and the ECE Guest Speaker Series. If the total number of seminars from the Guest Speaker Series and the ECE Colloquium is less than eight in a semester, credit is given for attending the available ones. Additionally, the ECE Colloquium sessions must constitute at least six, or fewer if available, out of these eight seminars, all of which are held at the regular times listed for the semester. For the seminars in the Guest Speaker Series, which can occur on any given day of the week, students are required to download, print, and complete the Guest Speaker Series attendance form available on the ECE website. This form must be endorsed by the faculty member who hosted the seminar. Upon completion, students should submit this signed form on the Colloquium Canvas site.

**Credit Requirements:** Students pursuing a PhD degree must accumulate a *minimum* of **72 credits** and uphold a **GPA of 3.5 or higher**. This total should encompass *at least 36 credits from graduate coursework* and another **24 credits dedicated to dissertation research**, identified by course codes 16:332:701 and 16:332:702. The *remainder of 12 credits* can be derived from additional graduate coursework or further dissertation research.

**Mandatory Coursework:** PhD students in the ECE Graduate Program have considerable latitude in choosing their graduate coursework, ranging between 36 to 48 credits, in consultation with their research advisor. However, to be eligible for the PhD Qualifying Examination, certain coursework prerequisites are mandated. Ideally, students should aim to **complete these prerequisites within the first three semesters** of their enrollment in the PhD program, but no later than by the end of the fifth semester. As highlighted earlier, all PhD students must select one of the specialization areas listed in Section [1. Introduction](#). Within each specialization, students are expected to **complete five (5) courses**, sourced from lists of **core courses**, **restricted elective courses**, and **mathematics elective courses**. Out of these, *four courses must be from the core and restricted elective lists*, ensuring a **combined minimum GPA of 3.75**. Additionally, *one course needs to be selected from the mathematics elective list* with a **minimum grade of B+**. The comprehensive list of mandatory coursework requirements, specific to each specialization and essential for the PhD Qualifying Exam, is detailed in [Appendix C — PhD Qualifying Exam Courses by Specialization Area](#). It is worth noting that certain specializations might lack a restricted elective course list.

- **Substitutions:** If students consider substituting any core or elective courses in their specialization with an unlisted course, they must seek approval from the ECE Graduate Program Office. Such petitions

should clearly justify the proposed substitution and may require backing from the student's research advisor. *Importantly, students should secure this approval before enrolling in the intended course.* Retrospective substitution requests might not be entertained. Also, the substitutions must be Rutgers ECE courses.

- **Cross-cutting Specializations:** The department is keenly supportive of cross-disciplinary specializations. Students with aspirations that traverse multiple specialization areas should consult with their research advisor to formulate a structured list of five courses. This list, comprising core, restricted elective, and mathematics elective courses, should ideally align with the guidelines presented in [Appendix C — PhD Qualifying Exam Courses by Specialization Area](#). Prior to enrolling in these courses as prerequisites for the PhD Qualifying Exam, students must obtain formal approval from the Graduate Program Office. Approvals for retrospective requests might be challenging, and unless there is a substantive justification, they are typically not favored.

## 4.2. Becoming a PhD Candidate

Upon admission to the PhD program, all students, irrespective of whether they possess an MS degree, are designated as **Pre-Qualifying PhD Students**. The transition from this status to that of a PhD Candidate, also known as a **Post-Qualifying PhD Student**, requires students to exhibit readiness for independent research in their selected specialization. This entails:

- **Completion of Mandatory Coursework:** Per the guidelines in Section [4.1. Course Requirements](#), students are required to complete a set of five courses specific to their specialization, meeting the stipulated GPA/grade criteria, as a foundational step towards achieving PhD candidacy. This mandatory coursework, to be finished within three to five semesters of joining the PhD Program, aims to cultivate a comprehensive understanding of the chosen domain. While an individual's research may not align precisely with all these subjects, a holistic grasp on related areas equips them to effectively articulate their research and stands them in good stead in their subsequent career.
- **PhD Qualifying Examination for Assessing Research Potential:** After fulfilling the mandatory coursework and deepening their expertise in the chosen specialization, students face the next essential step: the PhD qualifying exam. This exam is not just a test of what they've learned, but a comprehensive assessment to determine if they have the aptitude and readiness for the nuanced complexities of doctoral research. It seeks to measure a student's capacity for innovative thought, mastery over their domain, and their potential for self-driven research endeavors. Successful candidates are then instructed to complete the **PhD Candidacy Form**. With endorsements from both the PhD qualifying examination committee and the ECE Graduate Director, this document facilitates the Rutgers School of Graduate Studies in formally acknowledging a student's transition from an aspirant (pre-qualifying PhD student) to an official doctoral candidate (post-qualifying PhD student).

### 4.2.1. Policies for the PhD Qualifying Examination

**Qualifying Exam Timeline & General Policies:** After fulfilling the mandatory coursework and achieving the required minimum GPA for their specialization, PhD students are eligible for the PhD Qualifying Exam. While it is recommended they take this exam within the **first two years** of their program, they must absolutely take it **no later than the end of the third year**. Students have a maximum of **two attempts** for this exam. If a second try becomes essential, it needs to be within a year of the first. Failing both attempts may lead to a recommendation for the student's dismissal from the PhD program. Securing a research advisor and conducting preliminary research with them is crucial before attempting the qualifying exam, as it assesses research aptitude. In the absence of a research advisor, students must register for "Special

Problems” in their second doctoral year. This allows them to initiate research under a faculty member’s supervision in their chosen area of research, effectively preparing them for the PhD qualifying exam.

**Exam Format and Evaluation Criteria:** The purpose of the PhD Qualifying Exam is multifaceted. While the primary aim is to evaluate a student’s research potential, it also serves to measure their capability to present complex research findings effectively, handle in-depth and critical questions, and engage in scholarly discourse in their area of specialization. The comprehensive nature of this exam ensures that students are not only well-versed in their research topics but can also apply critical thinking and analytical skills to real-world challenges.

Students appearing for the qualifying exam are required to prepare a **written report** and deliver a **45-minute oral presentation** on their independent research to the PhD Qualifying Examination Committee. This presentation is followed by an **open-ended question-and-answer segment**, where questions can span from specific aspects of the research project to broader topics within the research specialization area. For the oral presentation, students must meticulously craft their content to align with the objectives of the qualifying exam. **Merely repurposing a conference presentation will not suffice.** The presentation should be tailor-made to reflect the student’s deep understanding, critical analysis, and capability to convey their research adeptly, keeping in view the exam’s distinct aims and criteria.

While there is a resemblance between the PhD qualifying examination and the PhD proposal defense, they are distinct. The qualifying exam takes place during the research’s early stages, and the presented material does not necessarily pave the way for a PhD thesis proposal. For the committee, while the originality and novelty of the research is a consideration, the central emphasis is on the student’s critical thinking prowess. They look keenly at the student’s capacity to critically analyze, interpret, and coherently discuss the strengths and weaknesses of their work.

When choosing a subject for the written report and oral presentation, while the decision is the student’s, consultation with both a faculty advisor and the ECE Graduate Director is highly recommended. Potential topics could include:

A conference paper submission, specifically tailored and expanded for the exam, developed under a faculty advisor’s guidance.

An MS thesis either in progress or previously completed, whether at Rutgers or another institution.

A concluding report from an ECE graduate “Special Problems” independent study course.

Post the oral presentation, the PhD Qualifying Exam Committee will fill out an Evaluation Form. This document, detailing their pass/conditional pass/fail recommendation alongside comprehensive feedback, is then relayed to the ECE Graduate Program Office. This procedure ensures evaluation transparency and provides students with crucial feedback on their performance.

**Scheduling, Examination Committee Composition, and Application Process:** The oral component of the PhD qualifying exam is offered once each semester during a two-week period, typically in the latter parts of October and March. Additionally, students have the flexibility to take the oral exam at any point during the summer months. To be eligible, students must submit a formal application to the ECE Graduate Program Office using the “PhD Qualifying Exam application” form available at the [ECE Graduate Forms and Information](#) page. This application should clearly indicate the selected research specialization for the exam and outline how the associated coursework prerequisites have been met. Alongside the application, students are required to submit their research paper, thesis, or report which complements their oral presentation. This should be presented to the ECE Graduate Program Office, accompanied by the name of the faculty member overseeing the research. Furthermore, students are encouraged to suggest three or more potential committee members for their oral examination.

The PhD Qualifying Examination Committee comprises a minimum of three members from the ECE Graduate Program Faculty (refer to Appendix [A.1. ECE Graduate Faculty](#)), which includes the student's advisor and the ECE Graduate Director. Importantly, **two faculty members—neither of whom can be the student's advisor—conduct the oral examination**. At least one of these examiners must be from the ECE graduate faculty. Thus, accounting for the student's advisor and the ECE Graduate Director, the committee totals four members. The ECE Graduate Director, after reviewing the student's research and chosen specialization, determines the final committee composition. This determination takes into account potential examiners suggested by the student. To clear the examination, **students need unanimous consent from both faculty members** who administer the oral exam. This decision is subsequently endorsed by the student's advisor and the ECE Graduate Director.

**Post-Examination Process:** After passing the PhD qualifying examination, students must update their status from pre-qualifying to post-qualifying doctoral candidate. To do this, students need to complete the Rutgers School of Graduate Studies (SGS) PhD Candidacy Form, also known as the Doctoral Qualifying Examination Form. This form can be found on the SGS website at <https://grad.rutgers.edu/academics/forms> and is also available on the ECE website at <https://go.rutgers.edu/nx6ov5k8>. On the second page of the form, signatures from all members of the PhD Qualifying Examination Committee and the ECE Graduate Director are required. Once all signatures are obtained, students should submit the form to SGS following the instructions provided on the form.

**Selection of Initial PhD Proposal and Dissertation Committee Members:** *Within a year of passing the PhD Qualifying Exam, students—in consultation with their research advisors—must identify and notify the ECE Graduate Program of their selection of at least three committee members. This selection can include their primary research advisor and is typically drawn from the ECE Graduate Faculty.* These members will join their PhD Proposal and Dissertation committees and will complement the guidance provided by the student's primary research advisor. While the research advisor plays a central role in directing and collaborating on the student's research, the committee members provide additional expertise, perspectives, and feedback. Moreover, these members play a vital role in the student's broader academic and professional development, offering insights into academic publishing, networking, and career pathways. Often serving as mentors, they offer support, advice, and encouragement, fostering an environment conducive to intellectual growth. *As research progresses, students may wish to add more members to their committee; however, removing any of the initial committee members requires the ECE Graduate Director's approval.*

### 4.3. PhD Proposal Defense

The PhD proposal is a pivotal step in a doctoral student's academic progression at Rutgers University. It lays out a comprehensive framework, aligning the student's research direction with the benchmarks of the ECE Graduate Program. This **formal document**, to be submitted to the Graduate Program Office, should conform to the **style guidelines** of the Rutgers School of Graduate Studies for PhD dissertations, which can be found at <https://grad.rutgers.edu/academics/graduation>. The proposal typically comprises several chapters, some of which may naturally evolve into the final dissertation. It should encompass:

1. Background and motivation
2. Key findings or activities to date
3. Essential unresolved questions and their significance
4. Strategy for the remaining research
5. Expected primary contributions and findings of the dissertation

The formal defense of the proposal requires a **50-minute oral presentation**, followed by an **open-ended question-and-answer segment**, before the **PhD Proposal Committee**. This committee includes the student's research advisor and *at least* three other members or associate members from the ECE Graduate Faculty (see Appendix [A.1. ECE Graduate Faculty](#)). While the primary advisor provides overarching direction for the research, the other committee members contribute their specialized expertise and perspectives. Notably, this committee may integrate one or two members from outside the ECE Graduate Program to introduce external viewpoints. *It is imperative for students—in consultation with their research advisors—to select and inform the ECE Graduate Program of their choice of a minimum of three committee members within a year after passing the PhD Qualifying Exam.* This ensures that the foundation of the PhD proposal committee begins taking form at most a year post-exam. Depending on their research path and to meet the **minimum committee size of four**, students may need to invite more members before the proposal defense. **Members confirmed by the end of the year post-qualifying exam automatically become part of the student's PhD Dissertation Committee post-proposal defense.** However, students retain the discretion to keep or change the additional members for the dissertation committee.

**Timeline and General Policies:** Students enrolled in the PhD program are encouraged to plan their proposal defenses *between their seventh and tenth semesters*. While these defenses are not open to the general public, faculty members from the Rutgers School of Graduate Studies are invited to attend. Acknowledging the digital age, virtual platforms like Zoom are allowed for the proposal defense, as long as the main event takes place at Rutgers University. Importantly, a majority of the committee members must be physically present, with a *maximum of two members participating virtually*.

**Scheduling, Procedure, and Application Process:** The proposal defense process initiates with the student completing the “PhD Proposal Scheduling Application” form available at the [ECE Graduate Forms and Information](#) page and send it to the Graduate Program Office *at least three weeks* in advance of the proposal defense date. The form requires the committee list, which must consist of a *minimum of four members*. *At least three* of these should be from the ECE Graduate Program, including the advisor. The committee can also have *up to two members from outside the ECE Graduate Program*. Subsequently, the student works with the proposal committee to set a date, time, and location for the presentation. *At least three weeks* before the presentation, the student must provide the ECE Graduate Program Office with a copy of the **proposal abstract**. This ensures that the office can notify the ECE Graduate Faculty promptly. Moreover, the student must distribute the proposal to both the committee members and the ECE Graduate Program Office *no less than two weeks* before the defense. At the conclusion of the PhD proposal defense, the student must obtain the *Doctoral Dissertation Proposal Presentation Form* signed by the PhD Proposal Committee, with the form available at <https://go.rutgers.edu/uceuouts>. It is crucial to understand that for a successful proposal defense, **only one non-approval vote is permissible**. Each student gets **two chances** to defend their proposal successfully.

## 4.4. PhD Dissertation Submission and Defense

The final tangible outcome of a student's PhD study is their dissertation, also known as the thesis. To obtain the PhD degree, a well-crafted dissertation must be submitted for assessment by the PhD Dissertation Committee. Furthermore, students are required to defend the research encapsulated in their dissertation during the final defense presentation. Collaboratively deciding on the dissertation's topic, content, and framework with their research advisor is essential. Upon approval by the PhD Dissertation Committee, the final dissertation becomes one of the pivotal documents required by the SGS to confer the PhD degree. For a deeper understanding of this procedure, kindly refer to Section [4.6. Checklist for the PhD Degree](#).

**Dissertation Format:** The dissertation format must align with the Rutgers School of Graduate Studies (SGS) style guide, available at <https://grad.rutgers.edu/academics/graduation>. This guide offers detailed

instructions on style, format, margins, footnotes, references, and beyond. Should there be queries about tables, graphs, images, or similar elements, students can direct their questions to the contact indicated on the SGS website.

#### 4.4.1. The PhD Dissertation Committee

Upon advancing to PhD Candidacy, students—in collaboration with their research advisors—should begin forming both the PhD Proposal and PhD Dissertation Committees. Notably, the PhD Dissertation Committee shares a significant overlap with the PhD Proposal Committee. This is because *students are mandated to choose and notify the ECE Graduate Program of a minimum of three committee members who will serve on both committees within a year of passing the PhD Qualifying Exam.*

The PhD Dissertation Committee should comprise *at least* **four members**, including:

- *The research advisor*, who must be a full member of the ECE Graduate Faculty and will serve as the **Chair of the committee**,
- *Two or more Full or Associate Members* of the ECE Graduate Faculty,
- *At least one person* who is **not** part of the ECE Graduate Faculty.

Furthermore, the following stipulations apply:

- *A minimum of two faculty members* on the PhD Dissertation Committee must have their primary appointment in the ECE Department (**core faculty**).
- If an external committee member is from outside Rutgers University, their participation must be approved by the Rutgers School of Graduate Studies (SGS). In this context, students are required to provide the ECE Graduate Program Office with the prospective member's curriculum vitae (CV) and a rationale for their inclusion, to facilitate official approval from the SGS.

Once the committee is formed, changes to its membership can only be made by the ECE Graduate Director and will be allowed solely if a member is unable to serve or if a shift in the student's dissertation topic necessitates a committee modification. In any other circumstances, approval must come from the Dean of the School of Graduate Studies.

*Students are advised to regularly inform the members of their PhD Dissertation Committee about their progress.* Doing so yields a richer and more varied set of feedback, helping guide the student's advancement and fostering professional ties. Furthermore, this ongoing communication allows committee members to provide early and substantial feedback if there are any concerns regarding the student's progression.

#### 4.4.2. The PhD Dissertation Defense

The culminating step toward obtaining a PhD is the final **dissertation defense**. This event consists of a seminar in which the PhD Candidate orally presents the findings of their dissertation in front of their PhD Dissertation Committee and a general audience, including individuals both from inside and outside Rutgers University. To hold the dissertation defense, a comprehensive version of the dissertation, formatted as per SGS guidelines and inclusive of all chapters, figures, tables, and references, must be submitted to both the PhD Dissertation Committee and the ECE Graduate Program Office *at least* **three weeks** in advance of the defense date.

To schedule the dissertation defense, the student must complete the "PhD Dissertation Defense Scheduling Application" form available at the [ECE Graduate Forms and Information](#) page and send it to the Graduate Program Office *at least* **three weeks** in advance of the dissertation defense date.

The dissertation defense must:

- *Be announced publicly* a minimum of one week prior to the event;
- Remain *open to general attendance*; and
- Ensure the presence of all members of the dissertation committee. virtual participation, such as via Zoom is permitted upon the agreement among all the committee members.

The dissertation defense is structured in the following manner:

- **Presentation:** The student gives a 50-minute presentation, which is open to the public.
- **Open Questions:** After the presentation, the student addresses questions from the audience.
- **Closed Questions:** At this stage, everyone except the student and committee members must exit the room. The committee then poses further questions to the student.
- **Deliberation:** The student is requested to leave, allowing the committee members to discuss both the presentation and the dissertation.
- **Evaluation:** Once the discussion concludes, the student rejoins the room. The committee then communicates their assessment of the dissertation and the defense to the student.

For a student to successfully defend the dissertation, approval is needed from the student's research advisor and all but one of the committee members. If two or more members voice dissent, efforts should be made to address and reconcile these concerns. This could lead to committee members requesting specific changes to the dissertation, which they must detail in writing. If these differences remain unresolved, the dissertation will be deemed unsatisfactory. Students can forward any appeals to the Dean of the School of Graduate Studies.

When the dissertation is approved, all committee members must sign the student's final defense form and the dissertation's title page. In the event the approval is not unanimous, the dissenting members are required to draft a letter outlining their reasons for disapproval. This letter should be sent to the Dean of the School of Graduate Studies, with copies provided to the ECE Graduate Director, the other committee members, and the student.

## 4.5. Graduation Paperwork and Deadlines

The Rutgers School of Graduate Studies (SGS) confers degrees at three distinct times throughout the academic year, corresponding to *January, May, and October degree dates*. Students can find the deadlines for each of these degree dates on the SGS website at <https://grad.rutgers.edu/academics/graduation>. Please note that it is the student's responsibility to stay informed about these deadlines.

To obtain a PhD degree, students must complete and submit the *Final Defense Form*, a crucial step in the graduation process. The form is available from SGS at <https://grad.rutgers.edu/academics/forms> and can be downloaded from the ECE website at <https://go.rutgers.edu/xl5gho5f>. *Initially, this form should be presented to the ECE Graduate Program Office for a review of credits and grades.* After receiving approval, students must secure signatures from their PhD Dissertation Committee on both the **final defense form** and the **dissertation's title page**. These signed documents should then be submitted to the Graduate Director for endorsement. Subsequently, ensure that both the signed form and title page are sent to SGS by the designated deadline. The form itself provides comprehensive instructions for its submission to SGS.

*As the ECE Graduate Program receives a large volume of requests around the time of graduation, it is crucial that students complete the Master of Science candidacy form several weeks before their anticipated graduation date. The ECE Graduate Program Office announces internal deadlines for graduation*

*paperwork, typically a couple of weeks earlier than the SGS deadlines, for January, May, and October degree dates. This proactive approach ensures that all requirements are met in a timely manner.*

In addition to the final defense form, students are required to complete the *diploma application* online on the SGS website. This process is another essential step in securing one's graduation status and must be completed by the indicated deadline. *Ensure your name is consistent on both the diploma application and the title page of your dissertation.* It should be identical in both places.

## 4.6. Checklist for the PhD Degree

The Rutgers School of Graduate Studies (SGS) website (<https://grad.rutgers.edu/academics/graduation>) houses a comprehensive checklist for PhD degree applications. To access this, please navigate to the **New Brunswick | Piscataway** section on the site. This checklist encompasses various components such as the *diploma application*, *final defense form*, *dissertation title page*, and *electronic submission of the dissertation*. For electronic submissions, use the following link: <https://etd.libraries.rutgers.edu/submit-your-etd>. The checklist also includes pertinent surveys. If you have questions or need further details regarding the final degree application process, the website provides contact information. Additionally, for specific inquiries or clarifications concerning the *final defense form*—a crucial element of the degree application—do not hesitate to contact the ECE Graduate Program Office.

## 5. REQUIREMENTS FOR GRADUATE CERTIFICATES

The ECE Graduate Program, in addition to its degree offerings, provides certificate programs. These certifications attest to a student's completion of a concentrated series of courses within a specific area. Students can pursue these certificates alongside their degree programs.

To earn a certificate, students typically must complete a specific set of courses, maintaining a *minimum combined grade point average (GPA) of 3.0*. Presently, the ECE Graduate Program offers graduate certificates in three specialized fields. The course requirements for each certificate are as follows:

- **Cybersecurity:** 12 credits (equivalent to 4 courses)
- **Machine Learning:** 12 credits (equivalent to 4 courses)
- **Socially Cognizant Robotics:** 9 credits (equivalent to 3 courses)

*For a comprehensive list of course options related to each certificate, refer to [Appendix D — Courses for Graduate Certificates](#).* For more in-depth information about these certificates, students are encouraged to visit the Rutgers ECE Graduate Certificate Programs website at <https://www.ece.rutgers.edu/certificate-programs>.

Once students fulfill the coursework criteria and attain the required GPA, they should complete the **Certificate Program Application**, which is available at <https://grad.rutgers.edu/academics/forms>. Afterward, this should be submitted to the ECE Graduate Program Office. The office will then forward it to the appropriate Certificate Program Director for validation. Upon the director's endorsement, students should forward the application to the Rutgers School of Graduate Studies, adhering to the provided instructions.

## 6. RUTGERS INTER-UNIVERSITY EXCHANGE COURSES

The Rutgers School of Graduate Studies (SGS) offers exchange programs allowing graduate students from degree programs to take courses at leading institutions throughout the region. Credits obtained from these courses can be applied towards their degrees. *There are two main exchange agreements in place:*

**Rutgers–Princeton Exchange Program:** This partnership between Princeton University and Rutgers University is *open to all graduate students* in the ECE Graduate Program. The policies for this exchange indicate that (1) there is a cap on the number of courses a student can enroll in per semester, and (2) any chosen course must be fundamental to the student’s degree program and unavailable at Rutgers.

**Inter-University Doctoral Consortium Exchange Program:** Reserved for *doctoral students* in the ECE Graduate Program, this program becomes *available after one has completed at least a full year of full-time PhD studies*. The Inter-University Doctoral Consortium allows students to enroll in courses across various participating institutions, a list of which can be found at <https://grad.rutgers.edu/academics/inter-university-exchange>.

For in-depth details on these programs, visit the SGS website <https://grad.rutgers.edu/academics/inter-university-exchange>. Students interested in pursuing courses under these agreements are advised to reach out to the ECE Graduate Program Office ([ECEGradProgram@soe.rutgers.edu](mailto:ECEGradProgram@soe.rutgers.edu)) for further assistance.

## 7. TRANSFER OF CREDITS

The Rutgers School of Graduate Studies (SGS) and the ECE Graduate Program permit the transfer of graduate credits from other institutions for students enrolled in the MS and PhD programs. For those in the Rutgers Combined BS/MS Program, undergraduate credits from Rutgers can be transferred towards their MS degree, provided these credits were not applied towards the undergraduate degree. Below are the general credit transfer guidelines applicable to all students and specific criteria for those in the BS/MS Program, MS Program, and PhD Program.

**General Policies:** Credits are eligible for transfer only after a student has completed **9 graduate credits** at Rutgers with **grades of B or higher**. Only courses that are relevant to the ECE Graduate Program and have **grades of B or above** will be considered for transfer; grades of B- are not accepted. *Any course taken more than six years prior to the transfer request will not be considered*. Additionally, research credits, lab credits, independent study credits, and other such by-arrangement credits are non-transferable. *Online courses are also excluded from transfer*. The department maintains that short courses, such as those during winter break, spring break, or two-week courses, cannot be applied to any degree requirements and are therefore non-transferable.

**Policy for BS/MS Students:** BS/MS students can transfer any number of graduate courses from Rutgers provided they were not counted towards their undergraduate degree. *They are also allowed to transfer up to 12 undergraduate credits from Rutgers if they were not applied to the undergraduate degree, including the residency requirement*. Courses meant for transfer should be at the 300 level or higher and appear as “unused” within the Degree Navigator. *It is essential to note that not all undergraduate courses, even if marked as unused in the Degree Navigator, are valid for the MS degree*. Detailed guidelines for eligible courses are provided in [Appendix F — Additional Guidelines for BS/MS Combined Program](#).

**Policy for MS Students:** MS students can transfer up to **12 graduate course credits** from an external institution towards their MS degree.

**Policy for PhD Students:** PhD students can transfer up to **24 graduate course credits** from another institution, usually stemming from the student’s MS degree.

**Procedure for Transfer of Credits:** The Transfer of Credit Application is available on the SGS website at <https://grad.rutgers.edu/academics/forms>. Once filled out, it should be submitted to the ECE Graduate Program Office for initial approval, after which it is sent to the School of Graduate Studies for final approval. Alongside the application, students must provide:

- Their official transcripts from both the institution they are transferring credits from and Rutgers.
- MS and PhD students need to attach the course syllabi from the semester/year they took the course, **including** the course description, required and/or referenced texts, topics covered, and evaluation criteria. If such syllabi are not available, support letters from the course instructors are required to justify the above information.
- BS/MS students should provide a screenshot from the Degree Navigator, showing the “unused” credits for their undergraduate degree.

## 8. ACADEMIC STANDING

The Department of Electrical and Computer Engineering’s **Graduate Academic Standing Committee** regularly oversees the academic progress of all graduate students pursuing degrees, reviewing each student’s performance after every semester. Additionally, the ECE Graduate Program evaluates the professional growth of doctoral students by annually administering and assessing their **Individual Development Plans (IDPs)**. The following outlines general policies regarding the academic standing of graduate students, with more specific details provided in the subsequent sections.

**Academic Performance Expectations:** Master’s students are required to maintain a *grade point average (GPA) of 3.0 or above*, while PhD students need a *GPA of 3.5 or above*. If a student’s GPA drops below these stipulated thresholds, they will be placed on **academic probation** (see Section [8.4. Academic Probation and Dismissal](#) for further details). Should the GPA not be raised above the required level within the following two semesters, it may lead to a recommendation for **dismissal** from the graduate program.

**Grade Limitations for Graduate Degrees:** For Master’s students, no more than *three grades of C or C+* may be counted towards their degree. Conversely, PhD students can count only *one grade of C or C+* towards their degree completion. Students who exceed these limits by receiving grades of C+ or below will be placed on **academic probation**. If they accrue any further such grades beyond the specified limits, a recommendation for their **dismissal** from the program will be initiated.

**PhD Student Progress and Advisor Selection:** PhD students who have not secured a *research advisor within their initial two years* will be placed on **academic probation**. *Pre-qualifying PhD students* who fail to attempt the qualifying exam by the end of their *third year* will also be placed on **academic probation**. Not taking the qualifying exam by the following semester may result in a recommendation for **dismissal**. During their third year, the Graduate Academic Standing Committee will evaluate the research progress of students without dissertation advisors. If by the end of this period, these students neither demonstrate satisfactory research progress, as assessed by the committee, nor find a dissertation advisor, the committee may suggest their **dismissal** from the program. Once PhD students have passed their qualifying exams and identified a dissertation advisor, their progress is consistently monitored by both their research advisor and the PhD Proposal and Dissertation Committees.

**Monitoring PhD Progress via Individual Development Plans (IDPs):** The ECE Graduate Program oversees the academic performance and professional growth of PhD students using Individual Development Plans (IDPs). Each PhD student is required to develop their IDP in collaboration with their advisor. If a student has not secured an advisor, they should work with the Graduate Program Director. The IDP must be submitted annually through <https://sgs-studentidp.rutgers.edu/>. Students who fail to receive approval for

their annual IDP may encounter an **academic block on their subsequent registration** until the IDP requirement is fulfilled.

**Upholding Academic Integrity:** All graduate students in the ECE Graduate Program must acquaint themselves with the <http://nbacademicintegrity.rutgers.edu/home/academic-integrity-policy> of Rutgers University–New Brunswick. Breaches of this policy, whether in coursework or research endeavors, carry severe repercussions and could result in expulsion from the graduate program.

## 8.1. Degree Time Limits

**MS Degree:** The ECE Graduate Program recommends a time frame of **3 years** for the completion of a full-time MS degree. Full-time students exceeding this duration typically would not be considered for admission into the PhD program. Additionally, they will be subject to review by the Academic Standing Committee, leading to **academic probation or eventual dismissal** from the program.

**PhD Degree:** For those pursuing the full-time PhD degree post their MS, the ECE Graduate Program stipulates a time limit of **6 years**. For students directly admitted into the PhD program after their bachelor's, the time frame is **7 years**. Students exceeding these durations will be subject to review by the Academic Standing Committee, leading to **academic probation or eventual dismissal** from the program.

## 8.2. Incomplete Grades

Students receiving an “Incomplete” (IN) grade must resolve it within **one semester** following the original semester. If not addressed within this period, the student must request its conversion to a “Permanent Incomplete” (PIN) through the ECE Graduate Program Office. *Students with more than one IN grade are given one semester to decrease the count to one or none.* If this is not achieved, they will be prohibited from registering for further courses until all IN grades are addressed. Students with IN grades will not be eligible for TA/GA/Fellowship support or for-credit internships and practical training. It is also crucial to note that the School of Graduate Studies will not permit students with IN grades to graduate. Furthermore, the ECE Graduate Program will not endorse degree applications for students with over two PINs on their records.

## 8.3. Full-Time Student Status

The ECE Graduate Program defines full-time study as a load of **9 credits**. This can comprise undergraduate remedial courses, graduate courses, graduate research (codes 332:701 and 332:702), GA Appointment (codes 332:866 and 332:867), and TA Appointment (codes 332:877 and 332:878). If a student needs to take remedial English courses, the 9 credit rule still applies. It is important to note that undergraduate course credits only count toward the MS and PhD degrees under certain conditions.

The program mandates that students enroll in at least 9 credits to maintain full-time status, with only a few exceptions:

- Students in their final term who have met all course requirements for their degree can register for fewer than 9 credits.
- Those preparing for the PhD Qualifying Examination can enroll in 6 credits during either the examination semester, the preceding semester, or both. The extensive preparation time for this exam is deemed equivalent to two 3-credit graduate courses.

Outside these exceptions, all students must maintain a 9-credit course load to retain full-time enrollment. Those who do not adhere to this policy are subject to review by the ECE Graduate Academic Standing Committee and may risk their full-time status.

## 8.4. Academic Probation and Dismissal

Certain actions or situations can impact a graduate student's academic standing in the ECE Graduate Program. It is essential to be aware of the different events and their consequence.

**Automatically Triggering Academic Probation:** Graduate students will be placed on academic probation under the following circumstances:

- Earning 1 F in any course.
- Accumulating 3 grades of C+ or below (for MS students) or 2 grades of C+ or below (for PhD students).
- Obtaining 3 Incomplete grades in a single semester.
- Letting the GPA fall below 3.0 for MS students or below 3.5 for PhD students.
- A pre-qualifying PhD student spending two years without securing a dissertation advisor.
- A PhD student not attempting the qualifying exam within three years of their study.

**Potential Triggers for Academic Probation:** There are situations which may lead to a graduate student being placed on academic probation. These include:

- Retaining an Incomplete grade that is not addressed in the immediate next semester.
- Full-time MS students extending beyond the recommended three years of their studies.
- Full-time PhD students exceeding the sixth year of study after earning their MS or the seventh year after direct bachelor's admission.

**Situations Requiring a Committee Review for Possible Dismissal:** Certain scenarios necessitate the convening of the Academic Standing Committee to determine the student's continuation in the ECE graduate program:

- Accumulating 2 F grades in courses.
- MS students receiving 4 grades of C+ or below, or PhD students accumulating 3 such grades.
- Being on academic probation continuously for two semesters.
- PhD students reaching the end of their third year without demonstrating substantial research progress. To be deemed as making progress, students should have a research advisor, be actively pursuing a unique dissertation topic, and show tangible advancements in their research.

## 9. APPEALS PROCEDURES

Appeals of a decision to recommend **dismissal** from the graduate program must be made in writing to the Graduate Academic Standing Committee. The committee will consider the appeal and vote to sustain or rescind the original recommendation.

Students who have concerns regarding the final **decision of the PhD Qualifying Examination** should first approach the ECE Graduate Director. If a resolution is not reached, they have the option to submit a written appeal to the Graduate Academic Standing Committee for a comprehensive review.

Student grievances concerning **course grades** should be addressed to the instructor of the course. If the matter is not resolved satisfactorily, the student may appeal to the ECE Graduate Director, who will attempt

to resolve the dispute informally. If this attempt is unsuccessful, the student may appeal in writing to the Graduate Academic Standing Committee.

Students may appeal decisions of the ECE Graduate Director, Graduate Academic Standing Committee, or graduate faculty, in writing, to the **Dean of the School of Graduate Studies** if they feel that the process by which the ECE Graduate Program reached its decision was unfair.

## 10. FINANCIAL AID

Pursuing graduate studies is an investment, both intellectually and financially. The ECE Graduate Program recognizes this commitment and offers various financial support mechanisms to help students throughout their academic journey:

- **Teaching Assistantships (TAs):** These positions are open to full-time graduate students with outstanding grades and a proficient command of the English language. TAs receive a monthly stipend, tuition remission, fee remission, and for those on appointments of 10 months or more, health insurance benefits. *The hiring process does not permit individual faculty members to select TAs independently.* Students who already have a research advisor should discuss TA opportunities with them. Those without a research advisor can apply directly to the department, but it is important to understand that TA positions are competitive. *The final decision on hiring and assignments of TAs lies with the Department Chair, not the Graduate Director.*
- **Graduate Assistantships (GAs):** Like TAs, GAs are also available to full-time graduate students and offer a monthly stipend, tuition remission, fee remission, and health insurance benefits for appointments lasting 10 months or more. These positions are funded by individual faculty members through their research grants. *Students keen on securing a GA position should reach out to faculty members directly.* A list of ECE Graduate Faculty can be accessed through Appendix [A.1. ECE Graduate Faculty](#).
- **Graders:** Occasionally, the ECE Department seeks graders for particular courses. These are hourly roles and do not come with additional benefits such as tuition/fee remissions and health insurance. Openings for graders are announced on the ECE graduate student mailing list, and interested individuals should apply when notifications are sent out.
- **Fellowships and Additional Opportunities:** Beyond TAs, GAs, and grader positions, the department periodically offers fellowships and other employment opportunities. These are communicated through the ECE graduate student mailing list, so students should remain attentive to these announcements.

Note that students awarded TA/GA/Fellow positions are restricted from taking up employment outside the department unless they have explicit permission from the ECE Graduate Director and the Dean of the School of Graduate Studies. For specifics about the benefits that come with TA and GA roles, like health insurance, students can contact the Department Administrator.

## 11. ETHICS GUIDELINES FOR UNIVERSITY-FUNDED STUDENTS

Teaching Assistants (TAs), Graduate Assistants (GAs), and Fellows are employees of Rutgers University and by extension employees of the State of New Jersey. The salary, tuition, and fringe benefits from these positions are in return for work and the expectation is that students will perform high-quality work. TAs should perform an outstanding job of teaching and grading, and be clear, professional, and timely in communicating with the students. GAs are expected to complete research tasks in an organized, effective, and professional manner.

TAs, GAs, and Fellows are expected to achieve excellent grades and complete the graduate program requirements in a timely fashion. Students pursuing a research-based degree (MS with thesis option or PhD) should be proactive in generating and shaping a research plan with their research advisor, gain expertise in the methods and tools relevant to that research, and be productive in completing research tasks and publishing results.

New TAs and Fellows in the ECE Graduate Program are reviewed after their first semester. They are expected to demonstrate satisfactory academic progress. Furthermore, if they are pursuing the MS with a thesis option or a PhD, they should have secured a research advisor by the end of their first semester. Additionally, TAs and Fellows undergo an annual review at the end of the spring term.

For reappointment as a TA, GA, or Fellow, students must meet the following exemplary performance criteria:

- Teaching Assistants should be making satisfactory academic progress in the graduate program and must be rated as excellent by both the course instructor and the students they teach.
- Graduate Assistants should be making satisfactory academic progress in the graduate program and must have a research advisor who confirms that the student's research is advancing appropriately.
- Fellows must demonstrate outstanding academic progress in the graduate program. If they are pursuing the MS with a thesis option or a PhD, they should have a research advisor who confirms that their research is advancing well. Additionally, Fellows are required to have a record of service to either the Electrical or Computer Engineering Department or the School of Graduate Studies.

## 12. REGISTRATION POLICIES AND PROCEDURES

### 12.1. Maintaining Enrollment with Matriculation Continued Status

The ECE Graduate Program recognizes that sometimes students might need to temporarily step away from active academic participation due to extraordinary circumstances. *In such instances, the “Matriculation Continued” status provides a way for students to maintain their enrollment.* To apply for this status, students must obtain the Matriculation Continued Application from the ECE Graduate Program Coordinator and submit it to the ECE Graduate Program Office for approval.

Ordinarily, the Matriculation Continued status is for students who wish to take a brief hiatus. However, there are specific scenarios where it can also be applied:

- **MS degree students** who have completed all course requirements but have yet to finish their MS Technical Paper can register under this status. The **exception** is if they are engaged in on-campus thesis research; in this case, they should register for *at least one research credit*.
- **Pre-qualifying PhD students**, having finished their course requirements, can use the Matriculation Continued status until they undergo their qualifying examination. Conversely, **post-qualifying PhD students are not eligible** for this status and are required to register for a *minimum of one research credit* each semester until their degree completion.

### 12.2. Application for Readmission

A student who has **missed one or two semesters of registration** must complete an *Application for Readmission* and submit it to the ECE Graduate Program Office for approval. Students who have missed **more than two semesters** without registration are **not eligible for reinstatement** through the ECE Graduate Program Office. Instead, they must file a *new Application for Admission* through the Graduate

Admissions Office.

### 12.3. Assistantship Registration

Students holding TA or GA positions must register for their assistantship appointments using the “E” credit prefix. Full-time TA and GA positions require a registration of 6 credits per term. Neglecting to register may jeopardize the renewal of the appointment. Specific courses to register for are:

**Teaching Assistants (TAs):** 16:332:877 (full time) and 16:332:878 (part time).

**Graduate Assistants (GAs):** 16:332:866 (full time) and 16:332:867 (part time).

Those without an official TA or GA appointment letter should refrain from registering for these courses.

### 12.4. Special Problems Courses

For students enrolling in a *Special Problems course (16:332:601 or 16:332:602)*, it is **mandatory** to first arrange supervision with a Rutgers faculty member. **Prior to registering** for the course, a *completed application form must be submitted* to the ECE Graduate Program Office for approval. Upon course completion, students will be assigned a standard letter grade.

**Note:** A maximum of **6 credits** from Special Problems can be applied to the Master’s degree, while the limit is **9 credits** for the PhD degree.

### 12.5. Undergraduate Courses

Typically, graduate credit is not awarded for undergraduate courses *unless* the student is part of the BS/MS Program or has obtained *explicit prior approval* from the ECE Graduate Program Office. To enroll in undergraduate courses, students must first seek approval by *submitting an application form* to the ECE Graduate Program Office.

### 12.6. Non-Credit Courses

Graduate students in the ECE Graduate Program **cannot opt for “Pass/Fail” grades** for their coursework. If taking a course on a **“not for credit” basis**, they must use an “N” prefix during registration. In such courses, students are required to complete all assignments except the final exam, and they’ll be graded with either an **“S” (satisfactory)** or **“U” (unsatisfactory)**.

## APPENDIX A — GRADUATE FACULTY AND COURSES

### A.1. ECE Graduate Faculty

The ECE Graduate Program is directed by its Graduate Faculty. This faculty includes individuals with primary appointments in the ECE department, as well as members from other departments whose research aligns closely with ECE's areas of specialization. Graduate Faculty members' ability to supervise MS and PhD student research varies depending on their membership tier:

- **Full Members:** Can advise both PhD and MS theses.
- **Associate Members:** Can co-advise PhD theses and directly advise MS theses.
- **Affiliate Members:** Can co-advise MS theses only.

To view the current roster of ECE graduate faculty, please visit the School of Graduate Studies website at <https://sgs-faculty.rutgers.edu/faculty/search/>. When searching, select “Active” under Status Type and choose “Electrical & Computer Engineering” for the Program.

### A.2. Graduate Course Descriptions

For an overview of graduate courses that have been approved for the ECE program, students are encouraged to visit the ECE Department website at <https://www.ece.rutgers.edu/graduate-course-descriptions>. While a comprehensive range of courses is recognized for the ECE program, it is important to note that only a select subset of these are offered each semester. For the latest information on upcoming course offerings, it is recommended that students check the **Schedule of Classes** (<https://sis.rutgers.edu/soc/>).

In addition to the standard course list, there are unique course categories to be aware of:

- **Advanced Topics Courses (332:519, 332:539, 332:559, 332:579, 332:599):** These innovative courses offer insights into emerging areas or delve deeper into established topics. Introduced by our graduate faculty, the content and titles of these courses may vary with each semester to reflect the evolving nature of the field.
- **Special Problems Courses (332:601, 332:602):** Tailored for those wanting a more customized learning journey, these “independent study” courses enable students to engage with a curriculum uniquely designed by a faculty member. It is especially suited for research-oriented students keen on diving deep into advanced topics that resonate with their specific research projects.

## APPENDIX B — MS CORE/ELECTIVE COURSES BY SPECIALIZATION AREA

This appendix outlines the core and elective courses tailored for various MS program specializations. *Students wishing to substitute any of the core or elective courses within their chosen specialization with an unlisted course should formally approach the Graduate Program Office.* All such requests should be accompanied by a rationale and, when relevant, an endorsement from the student's thesis advisor.

For certain specializations, some “Advanced Topics” courses—explicitly highlighted below—may qualify for credit towards that specialization. Students should liaise with the Graduate Director (GD) to determine if a particular course topic aligns with the intended concentration.

It is essential to note that this appendix does not explicitly cater to students with **cross-cutting specializations**. Such students should engage with their thesis advisor (if applicable) and the Graduate Director to develop an alternate study plan.

### B.1. Communications

Students pursuing the MS degree with a specialization in Communications are required to take *at least 3 Core courses* and **3 Restricted Elective courses** from the subsequent lists. In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

#### CORE COURSES

- 332:541 **Stochastic Signals and Systems**
- 332:542 **Information Theory and Coding**
- 332:543 **Communication Networks I**
- 332:544 **Communication Networks II**
- 332:545 **Digital Communication Systems**
- 332:546 **Wireless Communications Technologies**
- 332:548 **Error Control Coding**
- 332:549 **Detection & Estimation Theory: Inference & Machine Learning for Engrs**

#### RESTRICTED ELECTIVE COURSES

- 332:501 **System Analysis**
- 332:505 **Control System Theory**
- 332:506 **Applied Controls**
- 332:509 **Convex Optimization for Engineering Applications**
- 332:514 **Data-Driven Systems and Controls**
- 332:515 **Reinforcement Learning for Engineers**
- 332:519 **Advanced Topics in System Engineering** (*consult GD before registering*)
- 332:521 **Digital Signal Analytics**
- 332:525 **Optimum Signal Processing: Signal Process. & Machine Learning for Engrs**
- 332:539 **Advanced Topics in Digital Signal Processing**
- 332:557 **Quantum Computing and Communications Algorithms**
- 332:558 **Quantum Computing and Information Systems**
- 332:559 **Advanced Topics in Communications Engineering**
- 640:411 **Mathematical Analysis I**

- 640:412 Mathematical Analysis II
- 642:550 Linear Algebra and Applications
- 642:581 Graph Theory
- 643:573 Numerical Analysis I

## B.2. Signal and Information Processing

Students pursuing the MS degree with a specialization in Signal and Information Processing are required to take *at least* **3 Core courses** and **3 Restricted Elective courses** from the subsequent lists. In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

### CORE COURSES

- **332:509 Convex Optimization for Engineering Applications**
- **332:521 Digital Signal Analytics**
- **332:525 Optimum Signal Processing: Signal Process. & Machine Learning for Engrs**
- **332:530 Introduction to Deep Learning**
- **332:541 Stochastic Signals and Systems**
- **332:549 Detection & Estimation Theory: Inference & Machine Learning for Engrs**
- **332:557 Quantum Computing and Communications Algorithms**
- **332:561 Machine Vision**

### RESTRICTED ELECTIVE COURSES

- **332:501 System Analysis**
- **332:505 Control System Theory**
- **332:506 Applied Controls**
- **332:510 Optimal Control System**
- **332:512 Nonlinear Adaptive Control and Learning For Engineers**
- **332:514 Data-Driven Systems and Controls**
- **332:515 Reinforcement Learning for Engineers**
- **332:519 Advanced Topics in System Engineering** (*consult GD before registering*)
- **332:532 Multimodal Machine Learning for Sensing Systems**
- **332:533 Machine Learning for Inverse Problems**
- **332:539 Advanced Topics in Digital Signal Processing**
- **332:542 Information Theory and Coding**
- **332:558 Quantum Computing and Information Systems**
- **332:579 Advanced Topics in Computer Engineering** (*consult GD before registering*)
- **332:586 Biosensing & Bioelectronics**
- **332:598 Biomedical Technologies: Design and Development**
- 640:411 Mathematical Analysis I
- 640:412 Mathematical Analysis II
- 642:550 Linear Algebra and Applications
- 642:581 Graph Theory
- 643:621 Mathematical Finance I
- 643:622 Mathematical Finance II

- 954:596 Regression and Time Series Analysis for Data Science
- 960:565 Applied Time Series Analysis

### B.3. Machine Learning

Students pursuing the MS degree with a specialization in Machine Learning are required to take *at least 3 Core courses* and **3 Restricted Elective courses** from the subsequent lists. In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

#### CORE COURSES

- **332:443** Machine Learning for Engineers (*or its corresponding cross-listed course*)
- **332:509** Convex Optimization for Engineering Applications
- **332:515** Reinforcement Learning for Engineers
- **332:530** Introduction to Deep learning
- **332:541** Stochastic Signals and Systems
- **332:549** Detection & Estimation Theory: Inference & Machine Learning for Engrs
- **332:561** Machine Vision

#### RESTRICTED ELECTIVE COURSES

- **332:505** Control System Theory
- **332:514** Data-Driven Systems and Controls
- **332:516** Cloud Computing and Big Data
- **332:518** Mobile Embedded Systems and On-Device AI
- **332:521** Digital Signal Analytics
- **332:525** Optimum Signal Processing: Signal Process. & Machine Learning for Engrs
- **332:531** Probabilistic Methods for Large Scale Signal Processing and Learning
- **332:532** Multimodal Machine Learning for Sensing Systems
- **332:533** Machine Learning for Inverse Problems
- **332:542** Information Theory and Coding
- **332:557** Quantum Computing and Communication Algorithms
- **332:558** Quantum Computing and Information Systems
- **332:566** Introduction to Parallel and Distributed Computing
- **332:571** Virtual Reality Technology
- **332:573** Data Structures and Algorithms
- **332:539** Advanced Topics in Digital Signal Processing (*consult GD before registering*)
- **332:559** Advanced Topics in Communications (*consult GD before registering*)
- **332:579** Advanced Topics in Computer Engineering (*consult GD before registering*)
- **332:590** Socially Cognizant Robotics
- **332:595** Design Methods for Socially Cognizant Robotics
- **332:640** Robotics and Society
- 198:520 Introduction to Artificial Intelligence
- 198:530 Principles of Artificial Intelligence
- 198:533 Natural Language Processing
- 198:535 Pattern Recognition: Theory and Applications

- 198:536 Machine Learning
- 954:596 Regression and Time Series Analysis for Data Science
- 960:583 Methods of Inference
- 960:593 Theory of Statistics

## B.4. Systems and Controls

For students pursuing the MS degree with a specialization in Systems and Controls, the following course requirements apply. All students must take *at least 3 Core courses*. Those choosing the **thesis option** must also take a *minimum of 3 Restricted Elective courses*. On the other hand, students pursuing the **non-thesis option** are required to take *at least 4 Restricted Elective courses*. A crucial guideline is that *every student* must select *at least one course from List A of the Restricted Elective courses*. In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

### CORE COURSES

- **332:501** System Analysis
- **332:505** Control System Theory
- **332:506** Applied Controls
- **332:508** Digital Control Systems
- **332:512** Nonlinear Adaptive Control and Learning For Engineers
- **332:514** Data-Driven Systems and Controls
- 650:504 Advanced Controls I (*equivalent to 332:505; credit given for only one*)

### RESTRICTED ELECTIVE COURSES: LIST A

- **332:510** Optimal Control Systems
- **332:514** Stochastic Control Systems
- **332:515** Reinforcement Learning for Engineers
- **332:541** Stochastic Signals and Systems
- **332:509** Convex Optimization for Engineering Applications
- 650:505 Advanced Controls II

### RESTRICTED ELECTIVE COURSES: LIST B

- **332:519** Advanced Topics in Systems Engineering
- **332:521** Digital Signal Analytics
- **332:530** Introduction to Deep Learning
- **332:532** Probabilistic Methods for Large Scale Signal Processing and Learning
- **332:533** Machine Learning for Inverse Problems
- **332:542** Information Theory and Coding
- **332:543** Communication Networks I
- **332:549** Detection & Estimation Theory: Inference & Machine Learning for Engrs
- **332:539** Advanced Topics in Digital Signal Processing (*consult GD before registering*)
- **332:586** Biosensing & Bioelectronics
- **332:598** Biomedical Technologies: Design and Development
- 640:507 Functional Analysis I

- 640:515 Ordinary Differential Equations
- 640:517 Partial Differential Equations I
- 640:532 Introduction to Differential Geometry
- 650:512 Robotics and Mechatronics
- 650:606 Advanced Mechanical Engineering Topics: *Drones I, II*
- 711:557 Dynamic Programming
- 711:652 Nonlinear Optimization

## B.5. Computer Engineering

For students pursuing the MS degree with a specialization in Computer Engineering, the following course requirements apply. All students are required to take a *minimum* of **3 Core courses**. Among these, *at least 2 courses* should be selected from **List A of Core courses**, and *at least 1 course* must be chosen from **List B of Core courses**. Those choosing the **thesis option** must also take a *minimum* of **3 Restricted Elective courses**. On the other hand, students pursuing the **non-thesis option** are required to take *at least 4 Restricted Elective courses*. In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

### CORE COURSES: LIST A

- **332:516 Cloud Computing and Big Data**
- **332:518 Mobile Embedded Systems and On-Device AI**
- **332:563 Computer Architecture I**
- **332:565 Hardware and Systems Security**
- **332:573 Data Structures and Algorithms**
- 198:512 Intro. to Data Structures & Alg. (*equivalent to 332:573; credit given for only one*)
- 198:513 Design and Analysis of Data Structures and Algorithms

### CORE COURSES: LIST B

- **332:501 System Analysis**
- **332:509 Convex Optimization for Engineering Applications**
- 198:510 Numerical Analysis
- 198:521 Linear Programming
- 198:522 Network and Combinatorial Optimization Algorithms
- 198:524 Nonlinear Programming Algorithms
- 642:550 Linear Algebra and Applications
- 642:581 Graph Theory
- 643:621 Mathematical Finance I
- 643:622 Mathematical Finance II
- 643:573 Numerical Analysis I

### RESTRICTED ELECTIVE COURSES

- **332:507 Security Engineering**
- **332:514 Data-Driven Systems and Controls**
- **332:515 Reinforcement Learning for Engineers**

- 332:530 Introduction to Deep Learning
- 332:539 Advanced Topics in Digital Signal Processing (*consult GD before registering*)
- 332:543 Communication Networks I
- 332:544 Communication Networks II
- 332:560 Computer Graphics
- 332:561 Machine Vision
- 332:566 Introduction to Parallel and Distributed Computing
- 332:567 Software Engineering I
- 332:568 Software Engineering for Web Applications
- 332:569 Database System Engineering
- 332:571 Virtual Reality Technology
- 332:574 Computer Aided Digital VLSI Design
- 332:575 VLSI Array Processors
- 332:576 Testing of ULSI Circuits
- 332:577 Analog and Low-Power Digital VLSI Design
- 332:578 Deep Submicron VLSI Design
- 332:579 Advanced Topics in Computer Engineering
- 198:515 Programming Languages and Compilers
- 198:518 Operating Systems Design
- 198:519 Operating System Theory

## B.6. Software Engineering

For students pursuing the MS degree with a specialization in Software Engineering, the following course requirements apply. All students are required to take a *minimum* of **3 Core courses**. Students opting for the **thesis option** must take *at least* **3 Restricted Elective courses**, with *no more than two (2)* from **List B of Restricted Elective courses**. Conversely, those selecting the **non-thesis option** need to enroll in a *minimum* of **5 Restricted Elective courses**, with a *maximum of three (3)* from **List B of Restricted Elective courses**.

Furthermore, if a student's undergraduate transcripts lack any of the following courses, they must be completed:

- 332:252 Programming Methodology I
- 332:351 Programming Methodology II

Enrollment in these courses requires the graduate director's approval. *Please note, these remedial courses do not contribute to the ECE residency requirement.*

In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

### CORE COURSES

- 332:563 Computer Architecture I
- 332:566 Introduction to Parallel and Distributed Computing
- 332:567 Software Engineering I
- 332:568 Software Engineering for Web Applications
- 332:569 Database System Engineering
- 332:573 Data Structures and Algorithms

- 198:512 Intro. to Data Structures & Alg. (*equivalent to 332:573; credit given for only one*)

#### **RESTRICTED ELECTIVE COURSES: LIST A**

- **332:503** **Programming Finance**
- **332:507** **Security Engineering**
- **332:516** **Cloud Computing and Big Data**
- **332:518** **Mobile Embedded Systems and On-Device AI**
- **332:530** **Introduction to Deep Learning**
- **332:543** **Communication Networks I**
- **332:544** **Communication Networks II**
- **332:560** **Computer Graphics**
- **332:561** **Machine Vision**
- **332:565** **Hardware and Systems Security**
- **332:571** **Virtual Reality Technology**
- **332:579** **Advanced Topics in Computer Engineering** (*consult GD before registering*)

#### **RESTRICTED ELECTIVE COURSES: LIST B**

- 137:541 Enterprise Software Architecture (*in-person section only*)
- 137:560 Fundamentals of Systems Engg. for Engg. Management (*in-person section only*)
- 198:508 Formal Languages and Automata
- 198:515 Programming Languages and Compilers I
- 198:518 Operating Systems Design
- 198:519 Operating System Theory
- 198:530 Principles of Artificial Intelligence
- 198:543 Massive Data Storage and Retrieval
- 198:544 Computer Security
- 198:546 Computer System Security
- 198:553 Design of Internet Services

## **B.7. Electronic Devices, Circuits and Systems**

Students pursuing the MS degree with a specialization in Electronic Devices, Circuits and Systems are required to take *at least* **3 Core courses** and **3 Restricted Elective courses** from the subsequent lists. In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

#### **CORE COURSES**

- **332:574** **Computer Aided Digital VLSI Design**
- **332:578** **Deep Submicron VLSI Design**
- **332:580** **Electric Waves and Radiation**
- **332:581** **Introduction to Solid State Electronics**
- **332:583** **Semiconductor Devices I**
- **332:586** **Biosensing and Bioelectronics**
- **332:587** **Transistor Circuit Design**
- **332:588** **Integrated Transistor Circuit Design**

- **332:599**      **Advanced Topics in Solid State Electronics: *Semiconductors for AI***
- **332:599**      **Advanced Topics in Solid State Electronics: *Microelectronic Processing***

#### RESTRICTED ELECTIVE COURSES

- **332:557**      **Quantum Computing and Communication Algorithms**
- **332:558**      **Quantum Computing and Information Systems**
- **332:565**      **Hardware and Systems Security**
- **332:575**      **VLSI Array Processors**
- **332:589**      **RF Integrated Circuit Design**
- **332:591**      **Opto-Electronics I**
- **332:594**      **Solar Cells**
- **332:598**      **Biomedical Technologies: Design and Development**
- **332:599**      **Advanced Topics in Solid-State Electronics**
- 635:503      Theory of Solid-State Materials
- 642:527      Methods of Applied Mathematics I
- 642:528      Methods of Applied Mathematics II
- 750:501      Quantum Mechanics I
- 750:601      Solid State Physics I

## **B.8. Cybersecurity**

Students pursuing the MS degree with a specialization in Cybersecurity are required to take *at least 3 Core courses* and **3 Restricted Elective courses** from the subsequent lists. In the lists provided below, courses from the ECE department, which count towards the ECE residency requirement, are **bolded**. Meanwhile, courses from outside departments are presented in regular typeface.

#### CORE COURSES

- **332:507**      **Security Engineering**
- **332:542**      **Information Theory and Coding**
- **332:548**      **Error Control Coding**
- **332:549**      **Detection and Estimation Theory**
- **332:557**      **Quantum Computing and Communications Algorithms**
- **332:558**      **Quantum Computing and Information Systems**
- **332:565**      **Hardware and System Security**
- **332:579**      **Advanced Topics in CE: Adversarial Machine Learning**
- 198:544      Computer Security
- 198:546      Computer System Security

#### RESTRICTED ELECTIVE COURSES

- **332:501**      **System Analysis**
- **332:514**      **Data-Driven Systems and Controls**
- **332:515**      **Reinforcement Learning for Engineers**
- **332:516**      **Cloud Computing and Big Data**
- **332:518**      **Mobile Embedded Systems and On-Device AI**

- 332:530      **Introduction to Deep Learning**
- 332:541      **Stochastic Signal and Systems**
- 332:543      **Communication Networks I**
- 322:561      **Machine Vision**
- 332:563      **Computer Architecture I**
- 332:566      **Introduction to Parallel and Distributed Computing**
- 332:567      **Software Engineering I**
- 332:569      **Database System Engineering**
- 332:574      **Computer Aided Digital VLSI Design**
- 198:515      **Programming Languages and Compilers I**
- 198:518      **Operating Systems Design**
- 198:530      **Principles of Artificial Intelligence**
- 198:547      **The Security and Dependability of Distributed Systems**

## APPENDIX C — PhD QUALIFYING EXAM COURSES BY SPECIALIZATION AREA

This appendix details the coursework prerequisites for the PhD Qualifying Examination across various PhD specialization areas. For each area, the mandatory courses required to be eligible for the examination are provided, along with potential full-time ECE Department members of the graduate faculty who can serve as examiners. The Graduate Director retains discretion in the selection of examiners, which can include any Full member of the Graduate Faculty.

Students wishing to **substitute** any core or elective courses must seek approval from the ECE Graduate Program Office beforehand. Requests should justify the change and may need the student's research advisor's endorsement. *Late substitution requests may be declined.*

The department supports **cross-cutting specializations**. *Students with overlapping interests should collaborate with their research advisor to create a five-course list.* This list should align with the guidelines for PhD Qualifying Exam Courses by Concentration. Before registering, they must secure approval from the Graduate Program Office. *Retrospective requests are typically not favored without a strong justification.*

### C.1. Communications

**Potential Examiners:** Aggelos Bletsas, Waheed U. Bajwa, Yingying Chen, Salim El Rouayheb, Zoran Gajic, Shirin Jalali, Narayan Mandayam, Richard Martin, Athina Petropulu, Dario Pompili, Anand D. Sarwate, Emina Soljanin, Predrag Spasojevic, Wade Trappe, Chung-Tse Michael Wu

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

#### CORE COURSES

- 332:509 Convex Optimization for Engineering Applications
- 332:521 Digital Signal Analytics
- 332:525 Optimum Signal Processing: Signal Process. & Machine Learning for Engrs
- 332:541 Stochastic Signals and Systems
- 332:542 Information Theory and Coding
- 332:545 Digital Communication Systems
- 332:548 Error Control Coding
- 332:549 Detection & Estimation Theory: Inference & Machine Learning for Engrs
- 332:557 Quantum Computing and Communications Algorithms

#### RESTRICTED MATHEMATICS ELECTIVE COURSES

- 640:411 Mathematical Analysis I
- 640:412 Mathematical Analysis II
- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 642:527 Methods of Applied Mathematics I
- 642:528 Methods of Applied Mathematics II
- 642:550 Linear Algebra and Applications
- 642:581 Graph Theory
- 711:652 Nonlinear Optimization
- 711:685 Special Topics in Operations Research: *Convex Analysis and Optimization*

- 960:592 Theory of Probability
- 960:593 Theory of Statistics

## C.2. Networking

**Potential Examiners:** Aggelos Bletsas, Yingying Chen, Yao Liu, Narayan Mandayam, Ivan Marsic, Richard Martin, Jorge Ortiz, Athina Petropulu, Dario Pompili, Dipankar Raychaudhuri, Anand D. Sarwate, Predrag Spasojevic, Wade Trappe, Zhao Zhang

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

### CORE COURSES

- 332:509 Convex Optimization for Engineering Applications
- 332:530 Introduction to Deep Learning
- 332:531 Probabilistic Methods for Large Scale Signal Processing and Learning
- 332:532 Multimodal Machine Learning for Sensing Systems
- 332:533 Machine Learning for Inverse Problems
- 332:541 Stochastic Signals and Systems
- 332:543 Communications Networks I
- 332:544 Communications Networks II
- 332:546 Wireless Communication Technologies
- 332:568 Software Engineering Web Applications
- 332:573 Data Structures and Algorithms
- 198:512 Intro. to Data Structures & Alg. (*equivalent to 332:573; credit given for only one*)
- 198:513 Design and Analysis of Data Structures and Algorithms

### RESTRICTED MATHEMATICS ELECTIVE COURSES

- 640:411 Mathematical Analysis I
- 640:412 Mathematical Analysis II
- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 642:527 Methods of Applied Mathematics I
- 642:528 Methods of Applied Mathematics II
- 642:550 Linear Algebra and Applications
- 642:581 Graph Theory
- 711:652 Nonlinear Optimization
- 711:685 Special Topics in Operations Research: *Convex Analysis and Optimization*
- 960:592 Theory of Probability
- 960:593 Theory of Statistics

## C.3. Signal and Information Processing

**Potential Examiners:** Aggelos Bletsas, Waheed U. Bajwa, Kristin Dana, Salim El Rouayheb, Shirin Jalali, Daniel Burbano Lombana, Laleh Najafizadeh, Athina Petropulu, Dario Pompili, Anand D. Sarwate, Emina Soljanin, Predrag Spasojevic, Wade Trappe, Guosong Yang, Yuqian Zhang

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

#### CORE COURSES

- 332:509 Convex Optimization for Engineering Applications
- 332:514 Data-Driven Systems and Controls
- 332:515 Reinforcement Learning for Engineers
- 332:521 Digital Signal Analytics
- 332:525 Optimum Signal Processing: Signal Process. & Machine Learning for Engrs
- 332:531 Probabilistic Methods for Large Scale Signal Processing and Learning
- 332:533 Machine Learning for Inverse Problems
- 332:541 Stochastic Signals and Systems
- 332:542 Information Theory and Coding
- 332:545 Digital Communication Systems
- 332:549 Detection & Estimation Theory: Inference & Machine Learning for Engrs
- 332:557 Quantum Computing and Communications Algorithms

#### RESTRICTED MATHEMATICS ELECTIVE COURSES

- 640:411 Mathematical Analysis I
- 640:412 Mathematical Analysis II
- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 642:550 Linear Algebra and Applications
- 642:581 Graph Theory
- 711:652 Nonlinear Optimization
- 711:685 Special Topics in Operations Research: *Convex Analysis and Optimization*
- 960:565 Applied Time Series Analysis
- 960:567 Applied Multivariate Analysis
- 960:592 Theory of Probability
- 960:593 Theory of Statistics

## C.4. Computational Sensing

**Potential Examiners:** Aggelos Bletsas, Waheed U. Bajwa, Kristin Dana, Shirin Jalali, Laleh Najafizadeh, Jorge Ortiz, Athina Petropulu, Dario Pompili, Anand D. Sarwate, Predrag Spasojevic, Wade Trappe, Yuqian Zhang

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

#### CORE COURSES

- 332:509 Convex Optimization for Engineering Applications
- 332:514 Data-Driven Systems and Controls
- 332:521 Digital Signal Analytics
- 332:525 Optimum Signal Processing: Signal Process. & Machine Learning for Engrs

- 332:530 Introduction to Deep Learning
- 332:532 Multimodal Machine Learning for Sensing Systems
- 332:541 Stochastic Signals and Systems
- 332:561 Machine Vision
- 332:590 Socially Cognizant Robotics
- 198:534 Computer Vision
- 198:536 Machine Learning

#### **RESTRICTED MATHEMATICS ELECTIVE COURSES**

- 640:411 Mathematical Analysis I
- 640:412 Mathematical Analysis II
- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 960:5xx *Any course in Statistics (960) at the 500 level or above*
- 642:527 Methods of Applied Mathematics I
- 642:528 Methods of Applied Mathematics II
- 642:550 Linear Algebra and Applications
- 642:581 Graph Theory
- 711:652 Nonlinear Optimization
- 711:685 Special Topics in Operations Research: *Convex Analysis and Optimization*

### **C.5. Machine Learning**

**Potential Examiners:** Aggelos Bletsas, Waheed U. Bajwa, Yingying Chen, Kristin Dana, Zoran Gajic, Shirin Jalali, Laleh Najafizadeh, Jorge Ortiz, Athina Petropulu, Anand D. Sarwate, Bo Yuan, Yuqian Zhang, Zhao Zhang

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

#### **CORE COURSES**

- 332:509 Convex Optimization for Engineering Applications
- 332:514 Data-Driven Systems and Controls
- 332:515 Reinforcement Learning for Engineers
- 332:530 Introduction to Deep Learning
- 332:531 Probabilistic Methods for Large Scale Signal Processing and Learning
- 332:532 Multimodal Machine Learning for Sensing Systems
- 332:533 Machine Learning for Inverse Problems
- 332:541 Stochastic Signals and Systems
- 332:549 Detection & Estimation Theory: Inference & Machine Learning for Engrs
- 332:561 Machine Vision

#### **RESTRICTED MATHEMATICS ELECTIVE COURSES**

- 640:411 Mathematical Analysis I
- 640:412 Mathematical Analysis II

- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 642:527 Methods of Applied Mathematics I
- 642:528 Methods of Applied Mathematics II
- 642:550 Linear Algebra and Applications
- 711:652 Nonlinear Optimization
- 711:685 Special Topics in Operations Research: *Convex Analysis and Optimization*
- 960:565 Applied Time Series Analysis
- 960:567 Applied Multivariate Analysis
- 960:592 Theory of Probability
- 960:593 Theory of Statistics

## C.6. Systems and Controls

**Potential Examiners:** Daniel Burbano Lombana, Zoran Gajic, Guosong Yang, Jingang Yi, Qingze Zou

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

### CORE COURSES

- 332:501 System Analysis
- 332:505 Control System Theory
- 332:506 Applied Controls
- 332:508 Digital Control Systems
- 332:509 Convex Optimization for Engineering Applications
- 332:510 Optimal Control Systems
- 332:512 Nonlinear Adaptive Control and Learning For Engineers
- 332:514 Data-Driven Systems and Controls
- 332:515 Reinforcement Learning for Engineers
- 332:541 Stochastic Signals and Systems
- 650:504 Advanced Controls I (*equivalent to 332:505; credit given for only one*)
- 650:505 Advanced Controls II

### RESTRICTED MATHEMATICS ELECTIVE COURSES

- 640:411 Mathematical Analysis I
- 640:412 Mathematical Analysis II
- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 642:527 Methods of Applied Mathematics I
- 642:528 Methods of Applied Mathematics II
- 642:550 Linear Algebra and Applications
- 711:652 Nonlinear Optimization
- 711:685 Special Topics in Operations Research: Convex Analysis and Optimization
- 960:592 Theory of Probability
- 960:593 Theory of Statistics

## C.7. Computer Engineering

**Potential Examiners:** Yingying Chen, Kristin Dana, Shantenu Jha, Bokyoung Kim, Hang Liu, Yao Liu, Ivan Marsic, Jorge Ortiz, Dario Pompili, Deborah Silver, Sheng Wei, Bo Yuan, Zhao Zhang

**Coursework Requirements:** To be eligible for the Qualifying Exam, students must complete 3 *Core courses*, 1 *Restricted Elective course*, and 1 *Restricted Mathematics Elective course*. The combined GPA of the three *Core* and the *Restricted Elective* courses must be at least 3.75. Additionally, students must attain a grade of B+ or higher in the *Restricted Mathematics Elective course*.

*If students have received transfer credits for any of the prerequisite courses mentioned below, these credits cannot be used towards the Qualifying Exam requirement.* However, students can replace them with additional *Restricted Elective* courses. Consequently:

A student with transfer credit for 1 *Core* course can take 2 *Core* courses, 2 *Restricted Elective* courses, and 1 *Restricted Mathematics Elective* course.

A student with transfer credit for 2 *Core* courses can take 1 *Core* course, 3 *Restricted Elective* courses, and 1 *Restricted Mathematics Elective* course.

A student with transfer credit for 3 *Core* courses can take 3 *Restricted Elective* courses and 1 *Restricted Mathematics Elective* course.

### CORE COURSES

- 332:543 Communication Networks I
- 332:560 Computer Graphics
- 332:563 Computer Architecture I
- 332:565 Hardware and Systems Security
- 332:566 Introduction to Parallel and Distributed Computing
- 332:567 Software Engineering I
- 332:573 Data Structure and Algorithms

### RESTRICTED ELECTIVE COURSES

- 332:516 Cloud Computing and Big Data
- 332:518 Mobile Embedded Systems and On-Device AI
- 332:530 Introduction to Deep Learning
- 332:544 Communication Networks II
- 322:561 Machine Vision
- 332:579 Advanced Topics in Computer Engineering (*consult GD before registering*)

### RESTRICTED MATHEMATICS ELECTIVE COURSES

- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 642:5xx *Any course in Applied Mathematics (642) at the 500 level or above*
- 960:5xx *Any course in Statistics (960) at the 500 level or above*

## C.8. Software Engineering

**Potential Examiners:** Shantenu Jha, Dov Kruger, Hang Liu, Yao Liu, Ivan Marsic, Jorge Ortiz, Deborah Silver

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

#### **CORE COURSES**

- 332:516 Cloud Computing and Big Data
- 332:543 Communications Networks I
- 332:544 Communications Networks II
- 332:560 Computer Graphics
- 332:561 Machine Vision
- 332:565 Hardware and System Security
- 332:563 Computer Architecture I
- 332:566 Introduction to Parallel and Distributed Computing
- 332:567 Software Engineering I
- 332:568 Software Engineering for Web Applications
- 332:569 Database System Engineering
- 332:571 Virtual Reality
- 332:573 Data Structures and Algorithms

#### **RESTRICTED MATHEMATICS ELECTIVE COURSES**

- 640:5xx *Any course in Mathematics (640) at the 500 level or above*
- 642:5xx *Any course in Applied Mathematics (642) at the 500 level or above*
- 960:5xx *Any course in Statistics (960) at the 500 level or above*

## **C.9. Cybersecurity**

**Potential Examiners:** Yingying Chen, Salim El Rouayheb, Jorge Ortiz, Athina Petropulu, Anand D. Sarwate, Wade Trappe, Sheng Wei

**Coursework Requirements:** To be eligible for the Qualifying Exam, students are required to complete 4 Core courses with a collective GPA of at least 3.75 and 1 Mathematics Elective course with a grade of B+ or higher from the provided lists.

#### **CORE COURSES**

- 332:507 Security Engineering
- 332:530 Introduction to Deep Learning
- 332:542 Information Theory and Coding
- 332:544 Communication Networks II
- 332:548 Error Control Coding
- 332:557 Quantum Computing and Communications Algorithms
- 332:565 Hardware and System Security
- 332:567 Software Engineering
- 332:573 Data Structures & Algorithms
- 198:546 Computer System Security

### **RESTRICTED MATHEMATICS ELECTIVE COURSES**

- 640:5xx      *Any course in Mathematics (640) at the 500 level or above*
- 642:5xx      *Any course in Applied Mathematics (642) at the 500 level or above*
- 960:5xx      *Any course in Statistics (960) at the 500 level or above*

## **C.10. Electronic Devices, Circuits and Systems**

**Potential Examiners:** Umer Hassan, Mehdi Javanmard, Bokyoung Kim, Laleh Najafizadeh, Shriram Ramanathan, Chung-Tse Michael Wu, Minning Zhu

**Coursework Requirements:** To be eligible for the Qualifying Exam, students must complete 3 *Core courses*, 1 *Restricted Elective course*, and 1 *Restricted Mathematics Elective course*. The combined GPA of the three *Core* and the *Restricted Elective* courses must be at least 3.75. Additionally, students must attain a grade of B+ or higher in the *Restricted Mathematics Elective course*.

*If students have received transfer credits for any of the prerequisite courses mentioned below, these credits cannot be used towards the Qualifying Exam requirement.* However, students can replace them with additional *Restricted Elective* courses. Consequently:

- A student with transfer credit for 1 *Core* course can take 2 *Core* courses, 2 *Restricted Elective* courses, and 1 *Restricted Mathematics Elective* course.
- A student with transfer credit for 2 *Core* courses can take 1 *Core* course, 3 *Restricted Elective* courses, and 1 *Restricted Mathematics Elective* course.
- A student with transfer credit for 3 *Core* courses can take 3 *Restricted Elective* courses and 1 *Restricted Mathematics Elective* course.

### **CORE COURSES**

- 332:580      Electric Wave and Radiation
- 332:581      Introduction to Solid State Electronics
- 332:583      Semiconductor Devices I
- 332:587      Transistor Circuit Design
- 332:588      Integrated Transistor Circuit Design
- 332:599      Advanced Topics in Solid State Electronics: *Semiconductors for AI*
- 332:599      Advanced Topics in Solid State Electronics: *Microelectronic Processing*
- 635:503      Theory of Solid-State Materials

### **RESTRICTED ELECTIVE COURSES**

- 332:574      Computer Aided Digital VLSI Design
- 332:578      Deep Submicron VLSI Design
- 332:584      Semiconductor Devices II
- 332:586      Biosensing and Bioelectronics
- 332:589      RF Integrated Circuit Design
- 332:591      Opto-Electronics I
- 332:598      Biomedical Technologies: Design and Development
- 750:501      Quantum Mechanics I
- 750:601      Solid State Physics I

**RESTRICTED MATHEMATICS ELECTIVE COURSES**

- 640:5xx      *Any course in Mathematics (640) at the 500 level or above*
- 642:5xx      *Any course in Applied Mathematics (642) at the 500 level or above*
- 960:5xx      *Any course in Statistics (960) at the 500 level or above*

## APPENDIX D — COURSES FOR GRADUATE CERTIFICATES

### D.1. Certificate Program in Cybersecurity

The coursework for the cybersecurity certificate program must include a **minimum** of *two courses* from List A, and a **maximum** of *two courses* from List B:

#### LIST A

- 332:506 Applied Controls
- 332:507 Security Engineering
- 332:514 Data-Driven Systems and Controls
- 332:530 Introduction to Deep Learning
- 332:543 Communication Networks I
- 332:548 Error Control Coding
- 332:558 Quantum Computing and Information Systems
- 332:565 Hardware and System Security

#### LIST B

- 332:501 Systems Analysis
- 332:542 Information Theory and Coding
- 332:544 Communication Networks II
- 332:557 Quantum Computing and Communications Algorithms
- 332:561 Machine Vision

### D.2. Certificate Program in Machine Learning

The coursework for the machine learning certificate program must include a **minimum** of *two courses* from List A, and a **maximum** of *two courses* from List B:

#### LIST A

- 332:443 Machine Learning for Engineers (*or its graduate-level equivalent course*)
- 332:515 Reinforcement Learning for Engineers
- 332:530 Introduction to Deep Learning
- 332:549 Detection & Estimation Theory: Inference & Machine Learning for Engineers
- 332:561 Machine Vision

#### LIST B

- 332:509 Convex Optimization
- 332:514 Data-Driven Systems and Controls
- 332:518 Mobile Embedded Systems and On-Device AI
- 332:525 Optimum Signal Processing
- 332:531 Probabilistic Methods for Large Scale Signal Processing and Learning
- 332:532 Multimodal Machine Learning for Sensing Systems
- 332:533 Machine Learning for Inverse Problems

### **D.3. Certificate Program in Socially Cognizant Robotics**

The coursework for the socially cognizant robotics certificate program is comprised of the following three-course sequence:

- 332:640           Robotics and Society
- 332:590           Socially Cognizant Robotics
- 332:595           Design Methods in Socially Cognizant Robotics

## APPENDIX E — ADDITIONAL GUIDELINES FOR MS TECHNICAL PAPERS

### E.1. Developing a Technical Paper Topic

The technical paper requirement primarily serves to equip non-thesis students with robust technical writing and communication skills, essential tools for engineers in the professional arena.

*The Graduate Program strongly advises students to address this technical paper requirement through a course project in an ECE graduate course.* For those enrolled in courses culminating in a project, consultation with the instructor is crucial to ascertain:

Whether the project report can be adapted to fulfill the technical paper requirement.  
If adaptable, what specific additions or alterations are needed for the technical paper?

It is worth noting that instructors might sometimes request modifications to the initial report before endorsing its suitability as a technical paper.

*In instances where the course project was collaborative, producing an individual technical paper will require extra effort.* Students contemplating repurposing a collective project report for their technical paper should liaise with the course instructor. This is to discern the additional input required to draft an individual technical paper in line with graduation benchmarks.

### E.2. Securing Additional Readers

When a technical paper is derived from a course project, the course instructor, under whom the project was undertaken, must serve as the primary reader. Once this primary reader has approved the technical paper, students need to engage two additional reviewers. It is prudent for students to consult the original course instructor for recommendations of potential additional reviewers. Moreover, referencing the ECE Graduate Faculty list (see Appendix [A.1. ECE Graduate Faculty](#)) and their research specializations can guide students in pinpointing suitable reviewers for the technical paper.

Below is a suggested email template students can utilize when reaching out to faculty members to request their participation as a reviewer for the technical paper. **Note:** *Students are strongly discouraged from sending requests to every faculty member in the department.* It is essential to only approach a select group of faculty whose expertise aligns with the content of your paper and whom you genuinely wish to review your work. Mass email requests are considered unprofessional and often counterproductive, unlikely to yield the desired results.

Dear Professor [LAST NAME],

I am writing to request you to be a reader on my MS Technical Paper reading committee for my technical paper titled [TITLE OF PAPER].

The paper is about [SHORT DESCRIPTION OF THE TOPIC]. It is based off a term project that I completed as part of [COURSE NUMBER AND NAME] taught by Professor [LAST NAME], who [HAS/HAS NOT] reviewed the paper and has agreed to approve it as part of my requirements for the MS non-thesis option degree.

I am wondering if you would be able to serve as another reviewer for the paper?

The deadline for approval of the technical paper in order for me to graduate is [DATE]. This should give you [NUMBER] days to read and suggest revisions in case I need to make them.

I hope you will be able to help me with this key requirement for my MS degree.

Thank you,  
[YOUR NAME]

### **E.3. Recommended Timeline for Technical Paper Completion**

Students are urged to finalize their technical paper well in advance of their graduation. *It is optimal if the course project, which forms the basis of the technical paper, is undertaken during the second or third semester of the program.* This timeline ensures ample time for potential revisions, securing required signatures, and submitting the finalized paper along with associated forms.

## APPENDIX F — ADDITIONAL GUIDELINES FOR BS/MS COMBINED PROGRAM

### F.1. Transfer of Unused Undergraduate Credits for the MS Degree

The ECE Graduate Program has established the following guidelines for the transfer of unused undergraduate credits towards the MS degree:

#### 1. Course Level and Relevance

- **400-Level Courses:** We accept all 400-level unused undergraduate credits from any department, *provided they are relevant to electrical and computer engineering*. It is important to note that unrelated courses, such as 081:463 Advanced Photography A and 510:403 Ancient Warfare and Diplomacy, are ineligible.
- **Mathematics Courses:** For the Department of Mathematics, courses coded as 01:640 that are 300-level or above qualify for transfer.

2. **Type of Course:** *Only lecture-based courses are eligible for transfer.* Credits from labs, seminars, design-centric courses (like capstone design), independent studies, internships, and similar formats are not considered.

3. **Graduate-level Courses During Undergraduate Studies:** If students took graduate-level courses during their undergraduate studies, these are transferable, provided they weren't used to meet undergraduate degree requirements. Such claims can be verified through the Degree Navigator. Students must save a copy of their degree navigator page within three semesters after graduating from the BS program to avoid record deletion.

To ensure smooth integration of these credits and to avoid any potential confusion later, students are encouraged to liaise with the ECE Graduate Director. This interaction will provide clarity on which courses can be transferred to their MS degree.

### F.2. Policies for Core and Elective Courses

Undergraduate students at Rutgers ECE frequently enroll in “Topics” courses (codes 14:332:493 and 14:332:494). Notably, many of these courses are cross-listed with graduate offerings. *Students are advised not to re-enroll in the graduate versions of these cross-listed courses, irrespective of whether the undergraduate Topics course counted towards their BS degree.*

*If a Topics course aligns with a graduate course listed as a Core or Restricted Elective for a student's specialization, it will be deemed that the student has met that course requirement. **This holds true even if the course was not transferred to the MS degree.*** For instance, if a specialization mandates three core courses and the student previously undertook one of them as a cross-listed Topics course (which was not transferred to the MS degree), then the student is only obligated to complete two additional core courses.

## APPENDIX G — GRADUATE PROGRAM OFFICE APPROVAL PROCESSES

### G.1. For-Credit Internship Approval Process for MS Students

To initiate the internship approval process, students are required to submit the “For-Credit Internship Application” form (available at the [ECE Graduate Forms and Information](#) page) to the ECE Graduate Program Office. The for-credit internship must be pre-approved by the ECE Graduate Program Office before the start of the internship. It is crucial that students submit comprehensive and accurate documents to expedite the approval process. Please also account for a period of **3 weeks** for the process to be completed and plan your submission timeline accordingly.

### G.2. Training Approval Processes for F-1 and J-1 International Students

International graduate students in the Department of Electrical and Computer Engineering holding F-1 and J-1 visas can access specific training programs that permit employment outside of Rutgers. Specifically:

- **Practical Training (CPT and OPT):** This program grants F-1 students temporary off-campus employment opportunities to further their expertise or broaden their knowledge in their respective fields of study.
- **Academic Training (AT):** Exclusively for J-1 students, AT is an optional training experience directly tied to the student’s field of study.

The subsequent sections delve deeper into the details of these programs. It is important to note that while the ECE Graduate Program endorses these training programs, the final approval lies with Rutgers Global. Students should visit the Rutgers Global website at <https://global.rutgers.edu/international-scholars-students> and also consult a student advisor for a comprehensive understanding of the approval process. Additionally, students seeking to enroll in these programs should anticipate **processing times** at both Rutgers Global and the ECE Graduate Program, *which generally range from 10 to 15 working days*.

#### G.2.1. Curricular Practical Training (CPT)

*The CPT is a semester-specific work experience program for F-1 students, offered during the fall, spring, and summer semesters. It is designed to be undertaken before the academic program's completion. The Rutgers Global guidelines for CPT can be accessed at <https://global.rutgers.edu/CPT>.*

Within the ECE Graduate Program, CPT is open to both MS (thesis and non-thesis tracks) and PhD students. *To be eligible for CPT, students must meet the following criteria:*

- **Academic Tenure:** Students should have successfully completed *two semesters* in the department and maintained satisfactory academic progress.
- **Collaborative Project:** The student, their advisor, and the employing company must be engaged in a collaborative project. *This project must form an integral part of the student’s MS thesis, MS technical paper, or PhD dissertation.* The advisor’s letter must define the project topic and confirm the centrality of this project to the student's academic work. Concurrently, the company’s letter should detail the job role in a manner consistent with the advisor’s letter.
- **Technical Report Requirement (Non-Thesis MS Students):** Those pursuing the non-thesis MS track are obligated to write a technical report on their CPT work and submit it to the ECE Graduate Program Office. This report undergoes review by both the student’s advisor and the ECE Graduate Director.
- **Registration Requirements:** *Students must be registered full-time during the CPT semester. This equates to a minimum of 0 credits during summer, and at least 9 credits in the fall and spring semesters.*

However, for MS (Thesis option) and PhD students who have finished all coursework requirements, a 1-credit registration is needed for both fall and spring semesters. Specific courses that need to be registered by the MS (non-thesis option) and MS (thesis option) / PhD students are as follows:

- **MS students:** If participating in CPT during the fall or spring semesters, or engaging in CPT during summer with an intention to register for non-zero credits, students must register for 1 to 3 credits of either 16:332:601 or 16:332:602 (Special Problems) with a faculty member's approval. *This registration is categorized as a For-Credit Internship.* Accordingly, students should ensure they meet the guidelines provided in Section [3.5. For-Credit Internships for MS Students](#) and also adhere to the approval process outlined in Appendix [G.1. For-Credit Internship Approval Process for MS Students](#). *For those taking a 0-credit CPT, registration should be under 16:332:844 (Internship in ECE).* Importantly, activities pursued during CPT will be incorporated into their MS technical paper or MS thesis.
- **PhD students:** They have the option to register for 1 to 9 credits of 16:332:701 or 16:332:702 (Research in Electrical Engineering), 1-3 credits of 16:332:601 or 602 (Special Problems), or opt for the 0-credit 16:332:844 (Internship in ECE) during their CPT tenure. Importantly, activities pursued during CPT will be incorporated into their PhD dissertation.

Students satisfying the criteria outlined above can apply for CPT as follows:

Step 1: Complete the “ECE CPT Request Form” (available at the [ECE Graduate Forms and Information](#) page ) with all required signatures and email it to the ECE Graduate Director for review.

Step 2: After receiving a confirmation from the ECE Graduate Director for Step 1, apply for CPT through Rutgers Global by following the instructions at <https://global.rutgers.edu/employment#PracticalTraining>

## G.2.2. Optional Practical Training (OPT)

The OPT program offers F-1 students the opportunity to gain practical work experience directly related to their field and level of study, thereby enhancing their academic experience. There are two types of OPTs: Post-completion and Pre-completion. For detailed guidelines on OPT and to determine which option best suits your academic and professional goals, visit Rutgers Global at <https://global.rutgers.edu/opt> and consider consulting with a Rutgers Global advisor.

- **Post-completion OPT** is the standard type, allowing students to work after completing their coursework or degree requirements.
- **Pre-completion OPT**, while less frequent, permits students to work before they finish their program requirements. Students can only engage in part-time pre-completion OPT while school is in session and before completing all mandatory coursework.

Eligibility for OPT includes maintaining good academic standing and having no more than one “Incomplete” grade, granted it is from the immediately preceding semester. It is worth noting that this training duration will be deducted from the student's one-year allotment of post-degree Practical Training at Rutgers. To apply for OPT, follow these steps:

Step 1: Complete the “ECE OPT Request Form” (available at the [ECE Graduate Forms and Information](#) page) with all required signatures and email it to the ECE Graduate Director for review.

Step 2: After receiving a confirmation from the ECE Graduate Director for Step 1, apply for OPT through Rutgers Global by following the instructions at <https://global.rutgers.edu/employment#PracticalTraining>

### G.2.3. Academic Training (AT)

Academic Training (AT) is granted for a specific job role and is not a general work permit in one's field of study. AT for J-1 students can be categorized into two types: pre-completion and post-completion, or sometimes a blend of both.

- **Pre-completion Academic Training:** This refers to training initiated and concluded during your period of enrolled coursework or studies.
- **Post-completion Academic Training:** This involves training that either continues after or starts upon the completion of your coursework or studies. It necessitates an extension of the DS-2019 form. Consequently, prior to extension, financial backing and health insurance verification are mandatory. Applications for post-completion Academic Training must be submitted before finishing coursework/studies and before the current DS-2019 form expires.

*For AT approval, J-1 students should first engage with their sponsoring agency (if applicable) and then with Rutgers Global. Moreover, while applying for AT via Rutgers Global, students need to email the ECE Graduate Program Office to request AT. This email should encapsulate vital information like RUID, projected graduation date, degree month, endorsements from the sponsoring agency, letters of employment, and other pertinent details.*

### G.3. Reduced Credit Load (RCL) Approval Process for International Students

*F-1 and J-1 students must enroll in a full course load—equivalent to a minimum of 9 credits—every fall and spring semester. If students find themselves unable to meet this requirement, or if they fit a situation that qualifies for full-course status despite not taking a full-time credit load, they must obtain approval for a reduced credit load. International students should refer to Section [8.3. Full-Time Student Status](#) detailing the full-time status requirements for the ECE Graduate Program. However, even if they meet the ECE status, it is imperative to register for a reduced credit load with Rutgers Global to avoid jeopardizing their immigration status. Circumstances permitting a reduced credit load application encompass:*

- Course of study completion
- Academic challenges
- Graduate students having completed all formal coursework
- Students awaiting a mandatory course not available in the current semester
- Medical situations

For clarity on these stipulations, students are advised to liaise with a Rutgers Global advisor. *The ECE Graduate Program is not equipped to provide immigration counsel.* If a student opts to register for reduced credit load via Rutgers Global, please follow these steps:

Step 1: Complete the “ECE RCL Request Form” (available at the [ECE Graduate Forms and Information](#) page) with all required signatures and email it to the ECE Graduate Director for review.

Step 2: After receiving a confirmation from the ECE Graduate Director for Step 1, apply for RCL through Rutgers Global by following the instructions at <https://global.rutgers.edu/current-students>