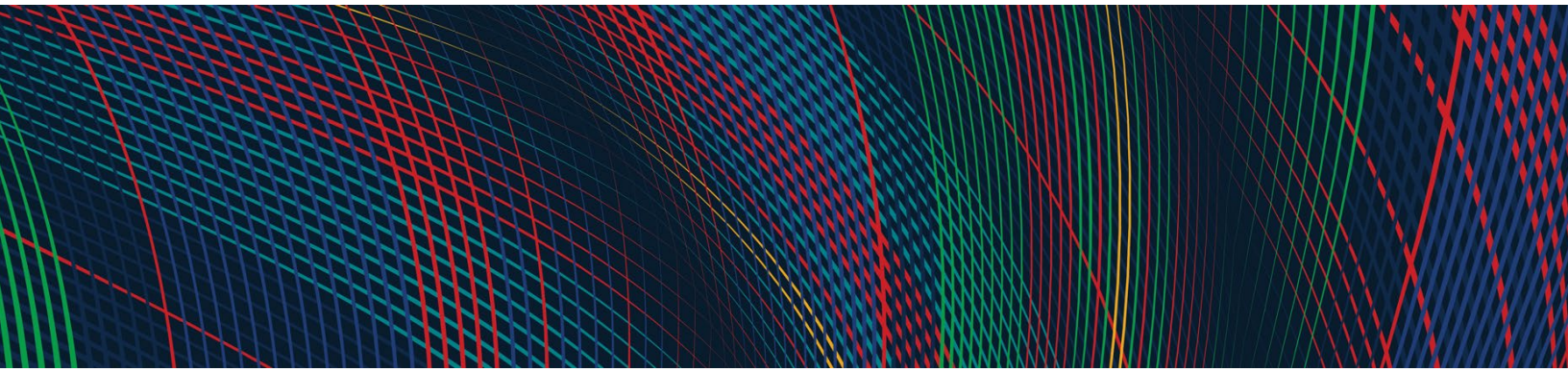
Carnegie Mellon University

Electrical & Computer Engineering



2026-2027
Ph.D. Catalog/Handbook
ECE Office of Academic Affairs

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TABLE OF CONTENTS

Contents

CORE VALUES **8**

Mission *8*

Philosophy *8*

INTRODUCTION **8**

Graduate Degrees and Programs Offered *8*

Graduate Student Catalog/Handbook *9*

DEPARTMENTAL INFORMATION **11**

Personnel *11*

Department Resources *11*

Academic Advisors 11

Faculty Advisors *12*

Individual Development Plan 12

Matching 13

Expectations 14

Co-Advisors *14*

Advisor Departure 14

Graduate Studies Committee (GSC) 15

Bulletin Boards 15

Tech & Receiving 15

Computer Clusters 15

Computing Resources 15

Printers 15

Department Office/Building Security, Repairs and Services 16

Keys 16

Lab & Office Space 16

Graduate Student Lounges 16

Department Office/Building Security, Repairs and Services 16

ECE Graduate Student Organizations 16

Press & Media Relations 17

Electrical & Computer Engineering Brand & Logos 17

PRE-MATRICULATION **18**

Admissions Policies *18*

English Language Proficiency Test *18*

Deferral *18*

Final Undergraduate Transcripts *19*

Responsible Conduct of Research (RCR) Education *19*

ENROLLMENT AND REGISTRATION **20**

Overview *20*

Degree Progress and Planning *20*

Student Responsibility 20

Degree Timeframe and Residency Requirement 20

Summer Registration Process & Procedures 21
Vacations & Time-Off 22
Full-time Requirements 22
Campus Location Tracking & Reporting Requirements 23
Obtaining an M.S. on the Way to the Ph.D. 23
Course M.S. 24
Thesis M.S. 24
Change of Degree Program 24
Center for the Neural Basis of Cognition (CNBC) Program 24
For incoming Ph.D. students with a B.S. degree 25
For incoming Ph.D. students with a M.S. degree 25
Joint Degree Programs 25
Courses Outside of Degree Requirements 25
Double Counting Courses 26
Retaking Courses 26
Auditing Courses 26
Pass/No Pass Courses 27
Petition Process 27
Course Transfer Request Policy and Process 28

Registering for Courses *29*
Course Load 29
Adding Courses 30
Course Locations 30
Dropping Courses 31
Withdrawing from Courses 31
Waitlists 31
Remote Courses 32
Courses with Time Conflicts 32
Prerequisites 32
Antirequisites 33
Corequisites 33
Cross Listed Courses 33

Final Exams *34*

Enrollment Verifications *34*

Leave of Absence *34*
Returning from a Leave of Absence 35

Degree Certification Process & Commencement *35*
ACADEMIC STANDARDS 37

Grades *37*
CIT Grading Policy 37
Incomplete Grade 37
Withdrawal Grade/Withdrawing from Courses 37

Academic Performance *37*
Quality Point Average 37
Probation 38
Satisfactory Progress & Program Dismissal 38
PH.D. DEGREE REQUIREMENTS 39

Overview *39*

Coursework *40*

Required course total 40
Professional Development coursework 41
Course Restrictions 41
Petitioning to Count a Course Not on the Pre-Approved List 41
Breadth Area Requirement *41*
Qualifying Exam Requirement *42*
Timeline 42
Full-time PhD students 42
Part-time PhD students 43
Deferment of Qualifying Exam 43
Retake Qualifying Exam Committee Selection 43
Mechanics 43
Outcomes 44
Research *45*
Teaching Internship Requirements *45*
Teaching Assistant Training Workshops 46
Teaching Assistant Positions 47
Evaluation and Certification of English Fluency for Instructors 47
Prospectus *47*
Prospectus Description 48
Prospectus Format 48
Prospectus Committee 48
Prospectus Procedure 49
Milestone Review 50
All But Dissertation Status Declaration *50*
Ph.D. Dissertation *51*
Departmental Progress Reviews *52*
Internships Course Option *53*
Summer Internships 53
Academic Year Internships 54
Internship Assessment and ECE Internship Faculty Supervisor 54
POST-MATRICULATION GUIDELINES 55
Return of University Property *55*
Career Services Employment Outcomes *55*
"Grandfather" Clause *55*
TUITION, FEES, FINANCES, ... 56
& FINANCIAL SUPPORT 56
Purchasing & Reimbursements *56*
Graduate Student Reimbursement Policy *57*
Business Expenses 57
Travel Expenses 57
Conditions 58
Academic Year Tuition & Stipend *58*
Summer Semester Tuition & Stipend *59*
Losing, Reducing, or Changing Funding *59*

Self-Supporting Students *59*
Fees *60*
Health Insurance *60*
Conference & Travel Funding *60*
Additional Sources for Financial Support *61*
Office of the Dean of Students Emergency Support Funding 61
Fellowships 61
GuSH Funding 61
Payroll 61
CAREER SERVICES **62**
Career Consultants *62*
Job Search Guidelines *62*
CMU First Destination Outcomes *62*
Employment with ECE Department *63*
Outside Employment *63*
ADDITIONAL DEPARTMENT & **64**
UNIVERSITY POLICIES/PROTOCOLS **64**
Suspension/Required Withdrawal Policy *64*
Withdrawal from Program *64*
Review/Redress of Academic Conflicts *64*
5000 Forbes Avenue 65
Pittsburgh, PA 15213 65

WELCOME TO ELECTRICAL AND COMPUTER ENGINEERING

Welcome to the Department of Electrical and Computer Engineering at Carnegie Mellon University. Since offering our first course in electrical engineering in 1908, our research and teaching has expanded to cover areas as broad as device sciences and nanotechnology, computer systems, data science, energy, control, communications, and circuits. The 2021 *US News and World Report* ranked our graduate programs in electrical engineering and computer engineering 7th and 5th in the nation, respectively, and we offer programs in Pittsburgh, Silicon Valley, Portugal, Thailand, and Africa.

Our distinguished faculty work closely with students to push the boundaries of technology and to shape the future of energy systems, bio-electronics, computing, data storage, and much more.

While this handbook is specific to your academic experience in the department, it is just one element of the Graduate Student Handbook Suite. There are several other resources within the suite that you should consult when needed:

- Your Program Handbook
- Your College's Handbook
- University-Wide Graduate Student Handbook
  (Office of Graduate & Postdoctoral Affairs)
- The Word Student Handbook

Please don't hesitate to contact us if you have any questions or comments.

Sincerely,

Larry Pileggi
Coraluppi Head and Tanoto Professor Electrical and Computer Engineering

CORE VALUES

The ECE Department has been a leader in both research and education for years; it is known for its innovative qualities, boldness of ideas, and unbridled enthusiasm. Our strategic plan is guided by our core values. We value scientific truth, creativity, quality, innovation, and engineering solutions, all within a diverse and inclusive community guided by respect and joy of doing.

Our core values form the foundation for what we do; we hold them to be intrinsically true. We believe in solving problems that have a large societal impact; we also believe that to be successful, we must work within an environment of enthusiasm and openness, respect and integrity, and freedom to express and explore a variety of ideas.

Mission

The ECE Department mission is:

> ***To inspire, educate, and produce electrical and computer engineers capable of tackling fundamental scientific problems and important societal challenges, and to do so with the highest commitment to quality, integrity, and respect for others.***

We aim to be the best at what we do, to apply all our skills and knowledge to execute our vision. We educate young people to become engineers sought after by industry and academia alike; we do so in an environment imbued by enthusiasm and love for what we do, with respect and willingness to listen to each other, with freedom to express our ideas and look at challenges from different points of view. We strive to be the ECE department of choice for those who are willing to step off the beaten path, for the visionaries and dreamers.

Philosophy

The Department of Electrical and Computer Engineering (ECE) at Carnegie Mellon University is dedicated to providing a world-class, transformative educational experience to the broadest possible student community. We foster an inclusive environment of learning, research, creativity, and collaboration, embracing and creating successful paths for students of all backgrounds and learning styles. Focused on both theoretical and applied studies, the ECE department incorporates ethics, fairness, and entrepreneurial thinking into all of its courses. We build innovative systems of every scale and scope that provide wide-reaching societal benefits, ensuring our work on campus has impact beyond the university's traditional borders.

INTRODUCTION

Graduate Degrees and Programs Offered

Master of Science in Electrical and Computer Engineering, Standard Program

- Pittsburgh
- Silicon Valley
- Thailand
- Africa

Master of Science in Electrical and Computer Engineering, Applied Program

- Pittsburgh
- Silicon Valley

Master of Science in Electrical and Computer Engineering, Advanced Study Program

- Pittsburgh

Master of Science in Electrical and Computer Engineering, Applied Advanced Study Program

- Pittsburgh

Master of Science in Software Engineering, Standard Program

- Silicon Valley

Master of Science in Software Engineering, Applied Program

- Silicon Valley

Doctor of Philosophy in Electrical and Computer Engineering

- Pittsburgh
- Portugal
- Thailand
- Washington, D.C.

Graduate Student Catalog/Handbook

This catalog/handbook is intended to set guidelines and expectations for new and current doctoral students in Electrical and Computer Engineering at Carnegie Mellon University. This catalog/handbook is not exhaustive and is subject to revision at any time by the ECE department. It covers Ph.D. students in Pittsburgh, Portugal, Thailand, and Washington, D.C.

It is the responsibility of each student to read and understand the contents of this catalog/handbook.

This catalog/handbook, along with any revisions, will be posted and announced annually to the ECE website. Students with disabilities may request this catalog/handbook in other formats by contacting the Academic Affairs Office and we will work with you to accommodate your request. In this catalog/handbook, ECE doctoral students can find all information they need to maintain good

standing in the program and complete the degree requirements on time.

Please see the Degree Timeframe and Residency Requirement section outlined in this handbook for additional information.

Along with this catalog/handbook, ECE doctoral students should be familiar with the Word – Student Handbook and with the College of Engineering website.

DEPARTMENTAL INFORMATION

Personnel

Throughout a student's time in the Ph.D. program, they will encounter a variety of faculty and staff who will help them on their way to completing their degree. Students may view a list of faculty and a list of staff affiliated with ECE online. Below is a list of faculty and staff whom students are likely to encounter during their time in the Ph.D. program.

- Dean of the College of Engineering: Professor William Sanders
- Associate Dean of Graduate and Faculty Affairs: Professor Lisa Porter
- Department Head: Professor Larry Pileggi
- Director, Office of the Department Head: Kimmy Nguyen
- Director, CMU-Africa: Professor Allen Robinson
- Associate Department Head for Research: Professor Shawn Blanton
- Associate Department Head for Academic Affairs: Professor James A. Bain
- Associate Department Head for Students: Professor Tamal Mukherjee
- Assistant Department Head for Finance and Sponsored Research: Charlotte Ambrass
- Director of Admissions and Academic Affairs: Tara Moe
- Director of Advising and Academic Services: Megan V. Oliver
- MS/UG Academic Program Advisor: Danielle Bonatesta
- MS/UG Academic Program Advisor: Jeannette Daly
- MS/UG Senior Academic Program Advisor: Monique C. Moreland
- MS/UG Academic Program Advisor: Kaycee Palko
- MS/UG Senior Academic Program Advisor: Holly Skovira
- MS/PhD Senior Academic Program Advisor, Silicon Valley: Brittany Bristoll
- MS Academic Program Advisor, CMU-Africa: Olga Gikundiro Buki
- PhD Senior Academic Program Advisor: Greta Ruperto

A general list of contacts can also be found on the ECE website.

Department Resources

Academic Advisors

Your academic advisor is a resource for having any university paperwork signed, asking questions regarding registration or the curriculum and guiding you to other important resources. Greta Ruperto is your Ph.D. Senior Academic Program Advisor.

Academic advising is done through the Academic Affairs Office located in Hamerschlag Hall 1110. The Ph.D. Academic Program Advisor administratively advises Ph.D. students throughout the entire

duration of the program. While program advisors do not provide content-specific expertise in ECE, they help students navigate the program by tracking milestones, meeting one-on-one and in groups with students for questions related to registration or the curriculum, guiding students to other important resources, completing enrollment and university-related paperwork, and answering questions for students who may not know where else to turn.

Greta can be reached by email: gruperto@andrew.cmu.edu by phone: (412) 268-8301, or in person in 1114 Hamerschlag Hall. To guarantee availability, you are encouraged to schedule an appointment through the online appointment scheduler, also found in the signature block of Greta's e-mail.

Faculty Advisors

Students also receive a faculty advisor. Faculty advisors help guide Ph.D. students through the program by ensuring that all students receive the necessary support and mentoring to succeed. The role of the faculty advisor focuses primarily on research, professional development, and career and course advising.

Some key ways in which PhD students will interact and collaborate with their Faculty Advisor

- Co-identification of Research Goals: Faculty advisors work closely with students to co-identify and refine their research goals. They help in developing a research plan that aligns with the student's interests and the department's academic standards.

- Preparation for Academic Milestones: Faculty advisors help students prepare for the academic milestones, such as qualifying exam, proposal, and the final defense. With the support of ECE PhD Senior Academic Advisor, Faculty advisors ensure students are adequately prepared and provide feedback on their progress.

- Professional Guidance and Mentoring: Faculty advisors provide guidance to ensure students receive the support and mentoring necessary to succeed.

- Career and Course Advising: While the academic advisor focuses on ensuring that students fulfill the ECE coursework requirements, faculty advisors offer tailored advice on courses that will best prepare students for their research and career goals.

- Academic Progress & Performance Evaluation: Faculty advisors work with students to set benchmarks for satisfactory progress each semester and to improve performance if expectations are not met. Occasionally, students fail to meet their advisor's expectations for satisfactory progress for one or more semesters, despite attempts to remediate substandard progress. Unsatisfactory progress may lead to an advisor-issued impending dismissal notice (typically sent during the first week of the semester in which a dismissal is taking place).

Individual Development Plan

Individual Development Plans (IDPs) are meant to promote professional and personal growth by formally documenting goals and facilitating dialogue, collaboration, and accountability between advisors and advisees. Carnegie Mellon has developed a set of templates that can be used by doctoral students and their advisors to create an Individual Development Plan. You can find the templates here: https://www.cmu.edu/graduate/resources/index.html

Matching

Within the first few weeks of entering ECE, most students are matched with faculty advisors using a "mutual match" process. During orientation, faculty from ECE's four areas give an overview of available research projects in order to help students find an advisor who aligns with his or her research interests. ECE's four research areas are:

- Integrated Systems (IST)
- Computer Systems-Hardware
- Computer Systems-Software
- Signal Processing, Communications and Controls (SPCC)

After the area overview, students are required to meet with all the faculty listed on their admission letter and are also welcome to meet with any other faculty member with an ECE affiliation. In addition to attending the orientation presentations, students can learn about an individual faculty member's research interests by viewing the faculty's member Curriculum Vitae and website (if available) and from meeting individually with different faculty members during the matching period.

Matching is done through a mutual matching process: students rank their top three [3] faculty preferences and faculty discusses their student preferences. A committee then matches each student with a faculty member, taking into consideration each of their preferences and other factors. Final matches will be communicated to students by the end of the first full month of enrollment.

Some programs have different matching processes. These variations are listed below.

Program	Matching Process

CMU | Portugal Dual Degree Program	CMU | Portugal dual degree students typically enter the program pre-matched based on recommendations from the Program Directors. One advisor will be from CMU and one advisor will be from the student's home institution in Portugal.

Expectations

Faculty advisors are expected to help guide Ph.D. students through the program by ensuring that all students receive the necessary support and mentoring to succeed. Each relationship between a student and his or her faculty advisor is unique and tends to evolve over the course of the student's time in the Ph.D. program. It is the responsibility of both the student and his or her advisor to identify goals, plans, and criteria for success in the Ph.D. program.

Occasionally, students request to switch advisors. While this request must be approved by the Academic Affairs Office, it is generally viewed as routine and is almost always granted. It is recommended that students pursue such switches early in the Ph.D. program so that their academic progress can continue as it is expected. To switch an advisor, a student must complete the Change of Advisor form.

Faculty advisors must have an ECE affiliation and be able to financially support the student for the duration of their studies.

Co-Advisors

It is possible for students to have more than one advisor at the same time. Usually, co-advising is done when a student is pursuing a topic that is interdisciplinary in nature or that would benefit from the expertise of two faculty members. Both advisors must have an ECE affiliation to co- advise an ECE student.

Advisor Departure

In case of advisor departure from CMU, Ph.D. students have the following options:

- Remain with advisor as a CMU student; physically located at CMU
- Remain with advisor as an enrolled CMU student, but work with advisor at their new institution
- Remain with advisor and transfer to advisor's new institution
- Find a new advisor at CMU and remain a CMU student

When an advisor leaves the ECE Department, the department usually arranges an information session for that faculty member's students to discuss this transition and their options.

Graduate Studies Committee (GSC)

The Graduate Studies Committee is a committee consisting of ECE faculty and ex-officio administrators from the Academic Affairs Office. The Graduate Studies Committee meets throughout the academic year to address student petitions, discuss program policies, and to approve and assign qualifying exams.

The GSC Chair for the 2022-2023 academic year is Professor L.R. Carley. Please ask your academic advisor when this semester's GSC meetings are scheduled to convene.

Bulletin Boards

Bulletin boards are located throughout the department in Baker Hall, Porter Hall, Hamerschlag Hall (HH), and Roberts Hall. Bulletin boards will be cleared on a regular basis.

Tech & Receiving

The Tech Electronics Shop and ECE Shipping and Receiving Department is located on the Pittsburgh campus in HH 1301 and its regular business hours are 9am-5pm ET, Monday through Friday. The Tech Electronics Shop offers a wide variety of parts, components, tools, and supplies used throughout the ECE Labs, which are available for use to all ECE students, faculty, and staff. The ECE Shipping and Receiving Department handles all incoming and outgoing packages for the department as well as the daily US Mail delivery. The ECE Shipping and Receiving Department has a large stock of shipping materials to assist with any outgoing package needs, as well as prompt notification of package arrival and delivery if necessary.

Computer Clusters

Computer clusters are located in HH 1303. There are several remote access compute clusters located in the ITS Cyert Hall machine room. Various research groups or principal investigators have their own computer clusters. Access to those clusters is only available with the consent of the party who owns the cluster.

Computing Resources

Computing resources are provided for students by their faculty advisors.

Printers

Printers are provided for student academic use. Printers: Printers are for use in the hallway in B23

outside of 109/110. Instructions for adding printers and policies are posted next to each printer.

Department Office/Building Security, Repairs and Services

Any damages or repairs should be reported to Facilities Management Services, by emailing fixit@andrew.cmu.edu. For security concerns and in an emergency, please contact University Police at 412-268-2323.

Keys

All key requests should be sent to keys@ece.cmu.edu and should be accompanied by your supervisor's approval. Key distribution will take 3-5 business days, assuming a copy of the desired key is on file. If a new key needs to be made, the request could take 7-9 business days. You will receive an e-mail once the key is ready for pick-up and supervisor approval has been received. To avoid any financial implications to you, your key must be returned prior to your final departure from CMU.

Lab & Office Space

Lab and office space will be assigned to students once they have been formally matched with a faculty advisor. Lab and office assignments may be modified at the discretion of the students' faculty advisor or the department. Students may not re-locate without prior permission from the department.

Graduate Student Lounges

The graduate student lounge in Pittsburgh is located in the top floor of Hamerschlag Hall.

Department Office/Building Security, Repairs and Services

Any damages, repairs, or security concerns should be reported to Tony Pacelli, Facilities Manager, by emailing apacelli@andrew.cmu.edu.

In an emergency, please contact University Police at 412-268- 2323.

ECE Graduate Student Organizations

- **PESO** (PhD Student Organization): Organizes social events and activities open to all PhD students in ECE, with the goal of enhancing the educational experience and overall quality of life for those in the represented programs. Website: https://www.ece.cmu.edu/student-resources/orgs.html

- **WinECE** (Women in ECE): Provides academic and social events to women in ECE throughout

the year. Website: https://winececmu.wixsite.com/winece

- **HKN** (Eta Kappa Nu): The honor society for Electrical and Computer Engineering students. Members engage in community service, professional engagement, and social activities. PhD students are invited by the board of HKN to join based on academic performance. Website: https://www.ieee.org/education/hkn-index.html

- **ECE Outreach:** A student organization that provides middle and high school students opportunities to learn about engineering and figure out whether it's a good career choice for them. The organization is run by ECE undergraduate and graduate student volunteers. Website: http://eceoutreach.ece.cmu.edu/index.html

For more information on graduate student organizations and opportunities for future involvement in the ECE department, please send email to ece-student- orgs@andrew.cmu.edu

Press & Media Relations

Krista Burns and Kimmy Nguyen act as the points-of-contact between news media and the ECE Department, including faculty, students, and staff. Krista and Kimmy can also provide guidance on internal and external relations and can assist with publicizing programs, projects, events, and other ECE affiliated activity.

Electrical & Computer Engineering Brand & Logos

The Information Technology Services (ITS) website contains information regarding the department's branding and identity standards. https://cmu-enterprise.atlassian.net/wiki/spaces/ITS/overview

PRE-MATRICULATION

Admissions Policies

For information about ECE's admission policies, including application requirements, application deadlines, and a link to apply, please visit these web pages:

- https://www.ece.cmu.edu/admissions/graduate-application-deadlines.html
- https://www.ece.cmu.edu/admissions/graduate-faq.html

English Language Proficiency Test

All international applicants whose "native" language is not English must take an English Language proficiency exam. The scores must be received by the application deadline for the semester in which students are applying. An English Language proficiency test is not required if the applicant will have graduated from a U.S. university by the time of enrollment, or if the applicant is a CMU student or alum. These students must take one of the following:

- Duolingo English Test - A minimum overall score of 105 is required, with minimum sub-scores of Literacy-105, Comprehension-115, Production-70, Conversation-95.
- TOEFL Exam - A minimum overall score of 84 is required, with minimum sub-scores of IBT-R 22, IBT-L 22, IBT-S 18, and IBT-W 22 are required. These requirements must be met from a single test date - we currently do not accept TOEFL MyBest scores.
- IELTS Exam - A minimum overall score of 7 on the IELTS is required, with minimum sub-scores of Reading-6.5, Listening-6.5, Speaking-6, and Writing-6.
- Non-native English speakers may utilize the Language Support in the Student Academic Success Center for language support: https://www.cmu.edu/student-success/.

Deferral

ECE generally does not allow admission deferrals because admission decisions are based on the current applicant pool. Therefore, students are offered admission into the program for a particular semester only. If a student wishes to attend in a future semester, the student must reapply to the ECE program.

Final Undergraduate Transcripts

Applicants admitted to any ECE program must submit final official transcripts, properly sealed, upon completion of their undergraduate program from the institution conferring their degree as a condition of enrollment at Carnegie Mellon. Certificates of graduation and/or degree certificates should also be submitted if provided by the institution. Failure to provide such documents that confirm the completion of undergraduate requirements by the end of the first semester of study at Carnegie Mellon may prevent the Ph.D. degree from being certified.

Responsible Conduct of Research (RCR) Education

The Office of Research Integrity and Compliance website https://www.cmu.edu/research-compliance/ describes the university's position on ethical research: "Carnegie Mellon University promotes the responsible conduct of research through high standards of ethics and accountability in planning, conducting and reporting research. The responsible conduct of research is demonstrated through behavior that meets generally accepted standards. These standards are set forth by state and federal regulations, institutional policies, professional codes of conduct and personal convictions."

In support of the university's position, ECE requires **all incoming students** to take the appropriate online training offered by the Collaborative Institutional Training Initiative (CITI). The CITI physical science module package is recommended rather than the module package for engineers, although both are acceptable. The courses are available via CITI through the Office of Research Integrity and Compliance website. Select Carnegie Mellon University as your participating institution when you create your account. Website: https://about.citiprogram.org/

The course(s) may take a few hours to complete but can be done over a period of time. Upon completion of the course(s), students will need to provide their certificate to the Graduate Affairs Office. Instructions on how to submit this certificate are communicated prior to the beginning of the semester.

ENROLLMENT AND REGISTRATION

Overview

After matriculating into ECE, students should create an academic plan and register for courses. Students should actively engage in their process by reviewing degree requirements on the website, connecting with their academic advisor, and conferring with their faculty advisor. Once plans are firm, students can proceed by accessing Student Information Online (SIO).

SIO is an important online tool to use during the registration process, as well as throughout graduate school. Students can access SIO with their Andrew ID at the HUB.

Within SIO, there is a Course Planning module that allows students to view and modify their proposed schedule before registering for courses. Once a schedule is developed, it is the student's responsibility to register for courses using their SIO. Students must be registered for every course that they plan to take for the semester, even if it is not taken for credit (e.g., audited courses).

After the first semester, a student's assigned registration time is determined by the number of completed units and cannot be changed. If a student's tuition balance and/or fees are greater than $0.00, the student will not be able to register until the balance is cleared.

Degree Progress and Planning

Student Responsibility

It is the sole responsibility of the student to manage the academic progression of their program. Students are expected to ensure that they are taking the necessary prerequisites and courses to complete degree requirements on time. Students have the ability to add courses, drop courses, and select units for variable unit courses through SIO. It is the students' responsibility to be aware of all academic deadlines, including the add deadline, the drop deadline, the pass/fail deadline, and the audit deadline. Academic deadline information can be found within the HUB's Academic Calendar.

If a student is not progressing as expected, they are expected to seek advice and counsel from their academic advisor and faculty advisor. If the student is concerned that they may be unable to complete degree requirements, they should contact their academic advisor and faculty advisor for assistance.

Degree Timeframe and Residency Requirement

Completion of the Ph.D. degree usually takes about four to six years of study (depending on if the student enters with a B.S. degree or an M.S. degree). At least one calendar year of full-time graduate study in residence is required by CIT (see 'Ph.D. degree' section). The length of the program might differ

for part-time students as the Proposal and Qualifying Exam timeline are different for part-time students (see 'Qualifying Exam Requirement' section)

ECE adheres to CIT's policy on PhD completion timelines. The CIT policy is as follows: "Passing the Ph.D. qualifying examination admits a student to candidacy for the Ph.D. degree for a period of no longer than six calendar years. If, at the end of this six-year period, the Ph.D. has not been awarded, the student must reapply for admission to the graduate program and will be judged competitively with other students applying at the same time." Students wishing to obtain an extension due to special circumstances must submit a formal petition at least one semester prior to his or her defense timeline expiring. The total time allowed to complete the Ph.D. degree requirements is six years following the successful completion of the Ph.D. Qualifying Examination milestone. A minimum of 144 units is required beyond the bachelor's degree. In calculating these 144 units, a student's master's degree from another institution can be factored towards the 144 units. Please see the Full-time Requirements section outlined in this handbook for additional information.

Students are encouraged to register as soon as possible for each semester to avoid waitlists and ensure that tuition and stipend support continues smoothly.

Students must be physically present and attend class at the start of the semester. If extenuating circumstances exist that prevent a student from attending class, a student must notify the academic advisor and instructors immediately. Not attending class from the start of the semester will have a detrimental effect on a student's progress in the program. ECE will make an effort to verify all students have arrived to begin their program and will consider a student as "withdrawn from the university" if he or she is not here by the tenth day of class as defined by the academic calendar.

International students must consult with CMU's Office of International Education (OIE) for questions on extension of their visa documents or if they complete their degree requirements prior to the end date on their I-20. Please see details and relevant forms on OIE's website under *Maintaining Legal Status*.

Summer Registration Process & Procedures

Students are expected to continue their research over the summer or pursue an internship that is relevant to their Ph.D. research. Any deviation from this expectation must be approved by the student's faculty advisor prior to the beginning of the summer semester.

Students who are performing full-time research with their faculty advisor should register themselves for 18990-R Reading and Research for 36 units during the Summer 1/All semester.

International students who are completing an internship in the United States must complete the paperwork for Curricular Practical Training (CPT). For more information about internships and CPT, see the Internship Course section outlined in this handbook. Academic and OIE advisors will provide students with information about CPT during the spring semester.

Vacations & Time-Off

Students with graduate assistantships are expected to continue with their research during academic breaks (including summer months) with the exception of official University holidays. Students need to consult their faculty about coverage if they have challenges with taking time off during University Holidays. Paid time off for personal business or vacations generally is not included as part of a graduate's financial support.

A supported graduate student who wants to take a short break (up to two weeks) must get approval for that break from their advisor in writing and, if required by the terms of the student's support package, must make up the work. The 2-week vacation policy is intended to be used once per year, preferably during the summer.

Supported graduate students wishing to take longer periods of personal time off must do so without financial support and must receive written approval from their faculty advisor at least three weeks prior to the requested time off. International students should pay particular attention to the rules governing their visa in relation to time off. The student's faculty advisor will notify the Department's Business Office of any such arrangements so that an appropriate adjustment in the student's support package can be processed.

University holidays include:

- New Year's Day
- Martin Luther King Day
- Memorial Day
- Juneteenth
- Independence Day
- Labor Day
- Thanksgiving Day
- Day After Thanksgiving
- Day Before Christmas
- Christmas Day
- Day Before New Year's Day

Full-time Requirements

Full-time students must be enrolled for a minimum of 36 units each semester – fall, spring, and summer.

Moreover, international students must be enrolled in a full course load (minimum 36 units) each semester to maintain their immigration status. Enrollment less than full time may be applicable at certain periods of the Ph.D. program (e.g., self-supporting in the final semester). See your academic advisor for more information.

Campus Location Tracking & Reporting Requirements

Students who are not based in Pittsburgh will be required to report their expected location for the future semester by responding to an email sent by the Academic Affairs Office before the beginning of every semester. This information is critical in ensuring that students are billed properly and, if they are traveling. to the United States from abroad, receive their visa in a timely fashion. Additionally, some programs regulate how long a student can be in Pittsburgh over the course of the program.

Any deviations from the location requirements outlined by the program must be approved by the student's faculty advisor. Additional information regarding funding may also be requested by the Business Office in order to facilitate the students' deviation from traditional location requirements.

Information on location requirements can be found in the following table:

Program	Location Details
CMU|Portugal **Dual-Degree Program**	CMU | Portugal dual degree students receive funding for a total of two years on the Pittsburgh Campus. Students and their advisors should work together to determine where the student will be physically located each semester. Three years will be spent in Portugal.

Once students have reported their location to Greta Ruperto, PhD Senior Academic Program Advisor, any change in plans should be communicated immediately and directly to the Academic Affairs office. It is the responsibility of the student and his or her advisor to communicate location information to the Academic Affairs office. Late or inaccurate reporting of future locations may limit a student's ability to travel to the United States and may result in inaccurate financial charges to the student's account.

Obtaining an M.S. on the Way to the Ph.D.

Many Ph.D. students wish to obtain an M.S. on the way to the Ph.D. in order to demonstrate their academic progress in the program and to have a milestone to show on their curriculum vitae/resume. Students interested in pursuing an M.S. degree on the way to Ph.D. program must contact Greta Ruperto, Ph.D. Senior Academic Program Advisor, to verify that they have fulfilled all the necessary requirements.

Ph.D. students have two M.S. options: M.S. course option M.S. or M.S. thesis option.

Course M.S.

The **course M.S.** option allows students to use up to 97 units of courses (1 unit of 18989 Introduction to Graduate Studies + 96 units of coursework) used toward their PhD degree (depending on if/how many research units are used). Indeed, students can use up to 27 units of 18990 toward the MS degree requirement.

Thesis M.S.

The **Thesis M.S.** option allows students to use 61 units (1 unit of 18989 Introduction to Graduate Studies + 60 units of coursework) of courses used toward their PhD degree and 36 units of 18990 + a research paper of 40 pages ECE Ph.D. students.

This paper will need to be approved by both the student's faculty advisor and a second reader who must be an ECE faculty member.

Both types of M.S. degrees require the completion of a Request for an M.S. Degree form. This form must be completed at least two weeks before the final grades deadline if a student is requesting an MS at the end of a given semester.

Change of Degree Program

Sometimes students begin the Ph.D. program and realize that they do not want to continue as a Ph.D. student. When this occurs, students may have the option of switching to the M.S. program. Switches to the M.S. program should be discussed with the student's advisor prior to filling out the switch to M.S. form to formalize the switch.

Please note that this switch must be made prior to or within the first 10 days of classes in the semester in which a student would like to switch to the M.S. program via the switch to M.S. form. After the 10th day of class, the switch will not be permitted until the following semester and the student will be expected to continue with Ph.D. research until the end of the semester.

Students who switch to the M.S. program will become financially self-supporting, meaning that they will no longer receive tuition or stipend support from the department. Prior to switching to the M.S. program, international students should consult with OIE.

Center for the Neural Basis of Cognition (CNBC) Program

ECE Ph.D. students interested in the neural basis of cognition can apply to the Center for the Neural Basis of Cognition (CNBC) Graduate Training Program, which allows students to combine neuroscience and engineering in an interdisciplinary training program.

The CNBC program offers a certificate graduate training program in collaboration with ECE and several other affiliated doctoral programs at Carnegie Mellon University and the University of Pittsburgh. The program trains interdisciplinary scientists interested in understanding how cognitive

processes arise from neural mechanisms in the brain. Students combine intensive training in their chosen specialty with broad exposure to other disciplines that touch on neural computation and problems of higher brain function.

Students who have been accepted to the ECE Ph.D. program can apply to participate in the CNBC graduate training program. The program requires four core courses in the areas of cellular and molecular neuroscience, systems neuroscience, cognitive neuroscience, and computational neuroscience. The CNBC program also includes several colloquium/seminar series, student-run journal clubs, research ethics training, and a variety of optional elective courses. Students in the CNBC program receive travel support and possible computer equipment support.

The following describes how the CNBC course requirements can be integrated with the ECE Ph.D. course requirements.

For incoming Ph.D. students with a B.S. degree

Students entering the ECE Ph.D. program with a B.S. degree will be able to complete the CNBC course requirements entirely within the framework of the ECE course requirements. In other words, these students will be able to complete the CNBC course requirements without taking units above and beyond the 96 units required for an ECE Ph.D.

For incoming Ph.D. students with a M.S. degree

Students entering the ECE Ph.D. program with a M.S. degree may petition the GSC for one CNBC course to be counted towards fulfillment of an ECE breadth area and course requirements. One other CNBC course will be allowed to count as an ECE-related course with no GSC petition required. The student will then need to take four more courses: two more to satisfy the CNBC requirements, and two more to satisfy the ECE breadth requirement and the 48 units required for an ECE Ph.D.

All students who are planning to complete the CNBC graduate training program along with an ECE Ph.D. are required to meet with their faculty advisor to discuss their course plans. The course plan must then be discussed with the Academic Affairs Office.

Joint Degree Programs

Joint degrees are when two departments come together to create one program and award one degree. The College of Engineering has a joint degree program with the Department of Engineering and Public Policy (under 'Joint Degrees with EPP').

Courses Outside of Degree Requirements

Courses that do not satisfy degree requirements include StuCo courses (98), Physical Education course (69), audited courses, and pass/fail courses. Similar to courses taken for degree requirements, students must register for these other courses, and the units will count towards their course load for

the semester. Students should confer with their faculty advisor for approval prior to registration.

Double Counting Courses

ECE follows the CIT Policy on double counting courses. Students are required to notify the Academic Affairs Office prior to declaring a degree outside of ECE as this may have repercussions for your units and coursework to date.

The same course taken two separate times will not count towards the ECE Ph.D. If a student takes the same course twice, the course with the higher grade will be counted towards the ECE Ph.D. course requirements.

Retaking Courses

If students do not pass a course, they should take a different course that will fulfill the requirement. Retaking a course is not recommended. Students who wish to retake a prerequisite course in which they did not receive the minimum grade required should first confer with their faculty advisor for approval. Should a student choose to retake a course, only the course with the higher final grade will be counted towards the ECE Ph.D., provided the student receives a "B-" or better.

All grades are recorded on the transcript and factored into the cumulative QPA. Depending on previous education (entering Ph.D. program with or without M.S. degree) approved courses will be factored into the 48 or 96 units that fulfill degree requirements are factored into the required

3.0 graduation QPA.

Auditing Courses

Auditing a course is being present in a classroom without receiving academic credit or a letter grade. An audited course will appear on a student's transcript. Students are permitted to audit courses in consultation with their faculty advisor. Please note that audited courses cannot count towards the Ph.D. Course or Breadth Area requirements. Students who are present in a classroom and who are not receiving academic credit or a letter grade must complete audit the class to continue to attend regularly.

A student who wants to audit a course is required to:

- Register for the course in SIO.
- Obtain permission from the instructor and ask the instructor to sign the course audit approval form.
- Submit the form to their academic advisor for approval.
- If approved, the academic advisor will send the form to the HUB for processing.

Once a course audit approval form is submitted to the HUB, a letter grade ('A'-'R') will not be

assigned for the course and the declaration cannot be reversed. You can find the deadline for submitting this form on the Academic Calendar. After the deadline, students will not be able to request the option to audit a course.

The extent of the student's participation must be arranged and approved by the course instructor. Typically, auditors are expected to attend class as though they are regular class members. Those who do not attend the class regularly or prepare themselves for class will receive a blank grade. Otherwise, the student receives the grade 'O', indicating an audit.

The units of audited courses count toward the maximum course load units, but do not count toward the degree requirements. Any student may audit a course. For billing, an audited course is considered the same as the traditional courses under the tuition charges. If a part-time student audits a course, he/she will be charged part-time tuition based on the per-unit tuition rate for the course.

Pass/No Pass Courses

Students who want to take a course pass/fail are required to register for the course and submit the pass/no pass approval form www.cmu.edu/hub/docs/pass-fail.pdf to their academic advisor. If approved, the academic advisor will send the form to the HUB for processing.

Once a pass/no pass approval form is submitted to the HUB, a letter grade ('A'-'R') will not be assigned for the course and the declaration cannot be reversed. Passing work (letter grade 'A'- 'C') is recorded as 'P' (passing grade) or 'S' (satisfactory) on the student's academic record, with both grades meaning the same thing; work with a grade at or lower than 'C-' will not receive credit and will be recorded as 'N' (not passing grade) on the student's academic record. No quality points will be assigned to 'P'/'S' or 'N' grades; the units of 'P'/'S' or 'N' grades will not be factored into the student's QPA.

The units of pass/no pass courses count toward the maximum course load units, but do not count toward the degree requirements. You can find the deadline for submitting this form on the academic calendar. After the deadline, students are not able to request to pass/no pass a course.

Petition Process

Petitions are approved by the Graduate Studies Committee (GSC). The Graduate Studies Committee (GSC) meets as required during the academic year (Fall semester: September – December; Spring semester: January – May). You can the GSC meeting dates and submission deadlines in the ECE PhD Portal.

The GSC reviews petitions on their merits in relation to department and college policies and precedent. Petitions to the GSC may include program transfers, breadth area substitutions, Ph.D. milestone extensions, increase in units, course substitutions and any other changes that are outside of the policies stated in the student handbook. Students are advised to discuss their petitions with their academic advisors.

Before submitting a petition, students should schedule a meeting with Greta Ruperto, PhD Senior Academic Program Advisor, to ensure the correct submission of required documents.

The petitions process is as follows:

- Students complete the appropriate petition form and submit it to their academic advisor in the Academic Affairs Office no later than 5 pm ET on the Friday before the GSC meeting.
- The academic advisor presents the petition to the GSC.
- Students are notified of the outcome of their petition via an email from the PhD . Academic Advisor after the GSC has met. Generally, all GSC decisions are final.
- Due to time constraints, some petitions may be tabled until the following GSC meeting. When this occurs, students will be notified via email.
- The academic advisor saves a finalized version of the petition in the student's academic file.

Course Transfer Request Policy and Process

Only one graduate-level course, or the equivalent of 12 units, can be transferred from another university as credit toward the Ph.D. degree. As a guideline, three-credit courses from other universities equate to 9-unit CMU courses; a four-credit course equates to a 12-unit CMU course.

The course being transferred in must:

- Fulfill an ECE degree course requirement and is equivalent to a CMU course
- Be considered a graduate level course at the university where it was taken (unless requesting transfer credit for the one allowed undergraduate course)
- Have not been used to fulfill requirements for any previously earned degree

Please note that this policy is more restrictive than the CIT transfer credit policy (under 'Transfer Credit and Special Students'). A grade of 'B' or better must be earned for the course to be transferred. The transfer credits will appear on the student's transcript and will not be factored into the QPA.

Transfer credit is not granted prior to admission and must be approved by the Graduate Studies Committee and CIT Dean's Office. After matriculating to Carnegie Mellon, ECE students should consult with their academic advisor before taking a course at another university.

Transfer courses will be reviewed for academic rigor and alignment with courses offered in ECE. The course description and syllabus, learning outcomes, delivery mode, and institutional accreditation will be considered when evaluating the course for transfer.

If a course has previously counted towards a degree, you may still request that the course count towards the Breadth Area requirement.

The process for petitioning to transfer a course is as follows:

- Meet with academic advisor and faculty advisor to discuss the course transfer
- Complete and collect the following mandatory documents:
- Petition for Graduate Studies Committee approval
- Official transcript from previous institution
- Detailed course description/syllabus (should include grading scale, assignments required, mandatory books, and time required in class) of the course you wish to transfer
- Letter from the previous institution's registrar or academic advisor stating the course intended for transfer was not used towards a degree
- E-mail endorsement from the instructor of the CMU course you believe your transfer course is most equivalent to
- CIT Graduate Transfer Credit Request form
- Submit the completed packet to the academic advisor
- The academic advisor will share the petition with the ECE Graduate Studies Committee.
- If the petition is approved, the academic advisor will work with the student to complete the transfer request.
- The academic advisor will present the transfer request to the CIT Dean's office and notify the student of the result.

Registering for Courses

In consultation with their faculty advisors, students should decide for which courses they want to register during the Spring and Fall semester. Students taking undergraduate and master's level courses must follow the procedures and deadlines for adding, dropping, or withdrawing from courses as identified on the academic calendar. Please refer to the HUB website for any additional information regarding course changes.

There is a separate calendar called **Doctoral Calendar** for designated doctoral-level courses. You can find it on the HUB website.

Please be advised that most of the courses doctoral students take follow the CMU Academic Calendar and not the Doctoral Calendar.

The Heinz College and the Tepper School follow their own calendars with dates that may differ from the University's calendar for course add, drop, and pass/fail/audit deadlines. ECE students must adhere to the deadlines of the courses they are taking if the courses are in Heinz or Tepper.

Course Load

Prior to registering each semester, it is strongly recommended that students consult with their faculty advisor in order to ensure that their course load is balanced and relevant to the student's Ph.D. research.

ECE Doctoral students should be registered for only one or two technical courses (12 units each) along with research units. If students want to take more than two technical courses, they should provide their PhD Senior Academic Program Advisor, Greta Ruperto their faculty advisor's written authorization to do so.

Some programs have specific registration requirements. These requirements are outlined in the table below.

Program	Registration Details
CMU | Portugal Dual Degree Program	CMU | Portugal dual degree students should register for at least 37 units in their first semester in Pittsburgh and 36 units during each semester before or afterward, regardless if they are located in Portugal or Pittsburgh.

Adding Courses

Students have the option of adding courses to their schedule starting at their assigned registration time until the add/drop deadline through SIO. If a student wishes to be added to a course after the add/drop deadline, the Course Add Request Form must be completed and signed by the course instructor. Then, the student must submit the form to their academic advisor for approval. If approved, the academic advisor will send the form to the HUB for processing.

In the event that an ECE course (18-XXX) is cross-listed with a course from another department, ECE students must register for the ECE course number.

Courses in the Tepper School of Business may be taken and can be registered for through SIO. If you encounter any problems while registering for a Tepper School Ph.D. course, or if you have any questions about the courses and the schedule, please email the Ph.D. program, tepper-phd@andrew.cmu.edu

Course Locations

Courses will take place at various buildings and room locations across CMU campuses as assigned by

the University Registrar's office each academic semester. Each course location is tied to a section and has a final assignment that is linked to the final grade. It could be in the form of a final exam, final project, or research as stated in the syllabus on the first day of classes. Students should register for sections of their courses according to their physical campus location. Please refer to the schedule of classes available on your campus.

Dropping Courses

Students have the option of dropping courses from their schedule starting at their assigned registration time until the add/drop deadline through SIO. When a course is dropped before the drop deadline, it does not appear on the transcript. As a courtesy to others, students should drop a course as soon as they decide not to take it. This will allow a waitlisted student to be enrolled and will limit the disruption to any team-based projects.

Withdrawing from Courses

Students should remove themselves from a course before the drop deadline each semester. If a student chooses to withdraw from a course after the drop deadline, the student must officially withdraw from the course and should consult with Greta Ruperto, Senior Program Academic Advisor, and faculty advisor to discuss the withdrawal. Students must complete and submit the Course Withdrawal Request form with their academic advisor in order to withdraw from a course. More information on withdrawal grades can be found on the CMU policy website under the grading policy. Withdrawals receive a "W" grade for the course on a transcript; this "W" grade is not factored into the QPA but the course does count towards the maximum units.

Waitlists

It is typical to be waitlisted from the time of registration up until the tenth day of class. This is common practice across the university to ensure that students within the department have the opportunity to take the courses they need in order to graduate. To determine the likelihood that you will be registered from a waitlist for an ECE course, students in Pittsburgh should send an e- mail to ece-waitlists@andrew.cmu.edu. You should only attend courses for which you are waitlisted if you have permission from the instructor. Students may only be waitlisted for a maximum of 5 courses.

As a courtesy, students should remove themselves from the waitlist and/or drop a course in a timely fashion so as to allow other students the opportunity to be removed from the waitlist and enrolled in a course.

Students should check their schedules frequently on SIO as they may be enrolled from a waitlist without being notified. In addition, during the registration process, the Registrar's Office will require students to "tag up" on their waitlists in order to confirm the desire to remain on the waitlist for a course. Failure to confirm their waitlists will result in being dropped from the waitlist. It is strongly

recommended that students have a back-up plan in case they are not removed from a waitlist by the tenth day of class.

Remote Courses

CMU offers courses that are taught exclusively online, and some have a live recitation component. ECE refers to them as "Technology Enhanced" courses and can be identified by the section code that includes "T". Departments with online courses may list their technology enhanced courses in a different format, so be sure to check with the instructor if it is unclear whether a course is online. International students on a US residential campus (i.e., Pittsburgh) may take a maximum of one online course per semester that does not have a required in-person component, per F-1 regulations.

Courses with Time Conflicts

Students who wish to register for two course sections with overlapping meeting times must submit a Course Time Conflict Request through Student Information Online (SIO). Approval does not guarantee registration; students must still meet prerequisites, reservations and other registration criteria. Additional information can be found on the HUB's website.

Prerequisites

While SIO may allow you to register for courses without the published prerequisite, it is the student's responsibility to have adequate background knowledge to be successful in the subsequent course. This background knowledge may come in the form of an introductory course taken at Carnegie Mellon, your undergraduate institution, or other work/research experience. We recommend that you consult with the instructor as it is at the discretion of the instructor to decide if a prerequisite course or knowledge can be waived.

For ECE courses that require 18-613/18-213 as a prerequisite, students will not be permitted to enroll in the subsequent course without credit for 18-613. 18-613 is the only course available to graduate students that satisfy the prerequisite requirement.

Some of the graduate courses that require 18-613/18-213 anywhere in their prerequisite tree include:

- 18-648 – Embedded Real-Time Systems
- 18-649 – Distributed Embedded Systems
- 18-725 – Advanced Digital Integrated Circuit Design
- 18-740 – Computer Architecture
- 18-742 – Parallel Computer Architecture
- 18-746 – Advanced Storage Systems
- 18-748 – Wireless Sensor Networks

- 18-756 – Packet Switching and Computer Networks
- 18-759 – Wireless Networks
- 18-842 – Distributed Systems
- 18-845 – Internet Services

Antirequisites

An antirequisite is a course with content that is so similar to another existing course that a student cannot receive credit for taking both. For example, 15-513 (Introduction to Computer Systems) and 18-613 (Foundations of Computer Systems) are antirequisites. The content in these courses are so similar that the student would not gain sufficient new knowledge from taking both courses as to be worthy of receiving academic credit. As a result, a student may only receive credit towards their degree for taking one of them. All antirequisites are listed in SIO.

Please find below a list of all the antirequisites of 15-513:

- 18600
- 18213
- 15213
- 15513
- 14513

Corequisites

A corequisite is a course that must be taken at the same time as another course. These courses will be listed and available for view in SIO.

A cross-listed course is a course that has two course numbers, each with their own section, but are taught or co-taught by the same faculty.

Cross Listed Courses

There are two types of cross-listed courses. The first is a course that has both an undergraduate and graduate section. For instance, 18-441 and 18-741 (Computer Networks) is a course within ECE that has both an undergraduate section and a graduate section. The second is a course that is cross-listed across two departments. For instance, 18-763 and 14-763 are courses that are cross-listed in ECE and the Information Networking Institute.

Selecting the appropriate section for these cross-listed courses is imperative. You will not receive credit for the graduate section of a course by registering for an undergraduate section, even if they

are cross-listed. Similarly, registering for the outside of ECE course section of a cross-list will not allow you to count it towards your ECE core, even if the course is cross-listed.

Final Exams

All ECE students must attend final exams as scheduled by the university and individual course instructors. If a student believes that a final exam presents a scheduling conflict, they must discuss the issue with the course instructor. The ECE administration does not have control over the university exam schedule. Please keep this in mind when arranging travel at the end of a semester; having purchased airline tickets is not a proper excuse for missing a final exam. Please refer to Carnegie Mellon University Policies on Examinations for additional information: https://www.cmu.edu/policies/student-and-student-life/examination-policies.html

Enrollment Verifications

The HUB is the primary contact for students or alumni who would like to request a transcript, enrollment verification, or other information related to their time in ECE.

ECE may verify some limited information in the form of a letter, which may be suitable for some purposes, such as the verification of skills students acquired through the ECE programs. Please contact your academic advisor for more information. Please note that the ECE department is only able to verify information on ECE and Computer Science courses. Information on courses offered in other departments can only be verified by the other department. To obtain a verification letter, the student or alumni should contact the Academic Affairs Office.

Leave of Absence

Occasionally, students must pause their degree program due to personal, professional, or academic reasons. A student who is considering a leave of absence should speak to his or her academic advisor prior to taking a leave of absence in order to ensure his or her understanding of the leave of absence policy and its ramifications.

Leaves of absences are capped at two calendar years' time maximum throughout the Ph.D. program, accrued either as a 2-year leave or amount to 2 years accrued through various leaves. In extreme cases, a student may request additional leave time via a petition to the GSC. If they do not return within two academic years, they will be administratively withdrawn from the graduate program. Students are not eligible to complete departmental milestones while on a leave of absence and must return from a leave of absence in order to complete any program requirements, including the Course requirement, Breadth Area requirement, Teaching Internships (TI), Qualifying Exam, Prospectus, and thesis or dissertation defense. In addition, the Academic Affairs Office cannot process adjustments to students records while students are on a leave of absence.

If an ECE student withdraws or takes a leave of absence, the HUB will determine if a student should

receive a tuition refund, as this is governed by CMU policy (not ECE). Additional information is available at the following link: https://www.cmu.edu/sfs/tuition/adjustment/index.html.

Students who intend to return to the Ph.D. program beyond or after the two-year leave cap must re-apply to the graduate program. Questions can be addressed to the Ph.D. Academic Program Advisor.

Once a student decides to take a leave of absence, he or she should complete the Leave of Absence form and bring it to their academic advisor for additional processing. Please note that the student's advisor must sign the leave of absence form. The student and their advisor(s)faculty are expected to have a conversation about the requirements for the student's return. ECE faculty are not required to hold spaces in their research group for students who are on leaves of absences. As a result, a student may need to be prepared to find a new faculty advisor and new funding in order to return from a leave.

Returning from a Leave of Absence

To return from a leave of absence, the student must have financial support and an ECE faculty advisor's approval. A student intending to return from leave must submit the Petition to Return from Leave of Absence form to their academic advisor at least 30 days prior to the start of the semester in which he/she plans to return. A student's return must coincide with the start of a new semester (fall, spring, or summer). Students cannot return from a leave of absence in mid- semester, with the exception of summers. The student must also meet any conditions that were set by ECE or the university at the time of leave was granted. Further information about Carnegie Mellon's policy on student return is available at the following link: https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/index.html.

Degree Certification Process & Commencement

Ph.D. degrees will be certified after students successfully defend their dissertation and submit all required paperwork, including publication permissions and contact information. In addition, students must have provided a final copy of their undergraduate transcript(s) and must have a tuition balance of $0.00 to receive a diploma. Students will be notified of their degree certification via email once the certification has been completed by the Academic Affairs Office.

Before graduation, students should update their contact information, such as mailing address and e-mail address, within SIO. Also, students should review a proxy of their diploma in SIO to verify the information displayed there, such as the spelling of their name.

Students who are certified in the summer or fall semesters will be invited to attend the following spring commencement ceremony. Spring graduates will be invited to the spring commencement ceremony. Students are not eligible to participate in the Doctoral Hooding Ceremony or the ECE Diploma Ceremony unless their degree has been certified by the Academic Affairs Office.

The title of the degree students receive is Doctor of Philosophy in Electrical and Computer Engineering.

ACADEMIC STANDARDS

Grades

CIT Grading Policy

ECE follows the CIT letter grade scale. The letter grade scale is 'A' (highest for CIT students), 'A-', 'B+', 'B', 'B-', 'C+', 'C', 'C-', 'D+', 'D', and 'R' (lowest). CIT students cannot receive an 'A+' grade on their transcript, even if a course is taken from another college where 'A+' is given.

ECE PhD students must receive a "B-" grade or better in both the graduate and undergraduate courses to count toward the program requirements. Grades lower than 'B-', meaning C + or below, will not count toward the ECE PHD degree requirements.

For more information, please see CIT's website: https://engineering.cmu.edu/education/academic-policies/graduate- policies/

Incomplete Grade

Incomplete grades will be assigned at the discretion of the course instructor, per the university grading policy.

Withdrawal Grade/Withdrawing from Courses

Students can withdraw from a course after the add/drop deadline until the course withdrawal deadline. This will result in a 'W' on the transcript, which is not factored into the QPA. To withdraw, the course withdrawal request form completed and submitted to the academic advisor for approval. If approved, the academic advisor will send the form to the HUB for processing.

Process for 'Withdrawal' from Program. University process can be found at:
https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/

Academic Performance

Quality Point Average

In order to graduate, each student must have a Quality Point Average (QPA) of at least 3.0 in the courses being used towards the required units for the Ph.D. program. Coursework or graduate project units with a grade lower than 'B-' will not be considered toward graduate degree requirements; however, they will be calculated into the student's cumulative QPA.

Probation

In the event that a student's semester or cumulative QPA falls below a 3.0, that student is on academic probation and will receive a letter from the department alerting them. While on probation, students must meet with their academic advisor and comply with their recommendations. Once a student's semester and cumulative QPA increase above 3.0, the student is automatically removed from probation.

Satisfactory Progress & Program Dismissal

Students are expected to make satisfactory academic progress each semester of the Ph.D. program. "Satisfactory" progress may be defined differently for each student. Students should work together with their faculty advisor to determine what satisfactory progress entails and to improve performance when a student receives feedback that progress has been unsatisfactory.

Occasionally, students fail to meet their advisor's expectations for satisfactory progress for one or more semesters, despite attempts to remediate substandard progress. When this situation occurs, faculty may issue an impending dismissal notice to students. Such letters may be issued within the first week of the semester in which a dismissal is taking place. This timing affords impacted students adequate time to make other arrangements to continue in the Ph.D. program or to transition to another program. Any exceptions from this policy are subject to approval from the department head.

Impending dismissal letters are drafted by the student's faculty advisor, and then sent to the Department Head and Academic Affairs Office for review and approval. Once the letter has been approved, the letter will be distributed to the student via email. The letter will outline the causes for dismissal and possible options for the student. Students who receive dismissal letters should schedule an appointment to meet with the Academic Affairs Office to discuss their options. International students should also schedule an appointment with OIE to discuss the potential visa ramifications of a program dismissal.

Faculty may rescind a dismissal letter in writing and must notify the Department Head and Academic Affairs Office of any such action. Dismissal from a program will result in the loss of the student's affiliation with CMU and their student status.

PH.D. DEGREE REQUIREMENTS

Overview

ECE Ph.D. students must satisfy multiple milestones before the doctoral degree is certified. These milestones addressed in this section include:

- **Coursework**
- **Breadth Area Requirements**
- **Qualifying Exam**
- **Research**
- **Teaching Internships**
- **Prospectus**
- **Thesis**
- **Dissertation defense**

Below is an example of a student's plan of study over the duration of the ECE Ph.D. program. Please note that this plan is an example and may vary based on whether the student has an MS degree prior to enrolling, on conversations between the student and his or her advisor, and which ECE Ph.D. program the student is enrolled in.

	Semester									
Milestones	F1	S1	F2	S2	F3	S3	F4	S4	F5	S5
Research	X	X	X	X	X	X	X	X	X	X
Courses & Breadth	1-2 classes	1-2 classes	1-2 classes	1-2 classes						
Qualifying Exam				X						
Teaching Internship			X			X				
Prospectus								X		
Thesis And Defense										X

Coursework

Students must receive a "B-" grade or better in both the graduate and undergraduate courses in order for the course to count towards the Ph.D. requirements. Grades lower than 'B-', meaning C + or below, will not count toward the ECE PHD degree requirements.

Prior to registering each semester, students should consult with their faculty advisor to ensure that their semester course load is balanced and relevant to their Ph.D. research.

Required course total

- Students in the Ph.D. program without a M.S. degree, and students in the Ph.D. program who have an ECE M.S. degree from Carnegie Mellon, must take a total of eight [8] ECE or related courses (totaling 96 units) at Carnegie Mellon. At least six of these eight courses must be approved graduate-level courses. In addition, students must also successfully complete a 1-unit Introduction to Graduate Studies course during their first semester in the Ph.D. program.

- Students in the Ph.D. program who have earned a M.S. degree elsewhere (outside of CMU's ECE Department) must take a total of four [4] ECE or related courses (totaling 48 units) at Carnegie Mellon. At least three of these four courses must be approved graduate- level courses. In addition, students must also successfully complete a 1-unit Introduction to Graduate Studies course during their first semester in the Ph.D. program.

- Students who received an M.S. in ECE from Carnegie Mellon may use their M.S. courses to count toward Ph.D. requirements.

- Students who have received an M.S. from Carnegie Mellon in ECE are strongly encouraged to schedule an appointment with the Ph.D. Academic Program Advisor to discuss their M.S. courses and which will count towards the Ph.D. degree requirement. In addition, students must also successfully complete a 1- unit Introduction to Graduate Studies course during their first semester in the Ph.D. program.

A comprehensive list of graduate courses that have been approved for the ECE Ph.D. can be found on the Ph.D. Breadth Area website. In addition to this list, any 12-unit ECE course at the 18-600 level or higher (found on the ECE course list webpage) is approved to count towards the ECE Ph.D. degree, except for any project, seminar and independent study courses.

Undergraduate courses that are pre-approved to count towards the ECE Ph.D. include ECE undergraduate courses 300 or above (18-3XX).

Please note that several courses outside of ECE have been approved by the Graduate Studies Committee (GSC) for use toward the PhD requirements. However, because these courses need to be periodically reviewed by the GSC, they are not listed here. If students are interested in taking a course that is not on the approved course list, please reach out to the PhD Senior Academic Program Advisor, Greta Ruperto to inquire about the course and the potential need for a petition.

Students who joined the PhD program in Fall 2022 and prior, and have taken graduate-level courses in the Computer Science (CS) Department (700 level and above) should send an email to the PhD Senior Academic Program Advisor, Greta Ruperto to discuss. Note that these courses will still count toward your degree requirements.

ECE coursework requirements must be completed before students' doctoral status lapse. See the CIT's policy on PhD completion timelines.

Professional Development coursework

Up to twelve (12) units total of professional development coursework in ECE may be counted towards the ECE Ph.D. Course requirement, in any combination of the following course list:

- 18-996 (3 units)
- 18-997 (3 units)
- 18-998 (3 units)

Course Restrictions

Students are responsible for checking the syllabi for classes to ensure their courses are not deemed as a restricted course by the following criteria:

- Courses where more than 50% of the course grade is based on a group project or more than 20% is based on attendance are restricted.
- Mini courses worth 12 units are restricted.
- No more than 12 units of professional development coursework can be applied toward the Course requirement.

Petitioning to Count a Course Not on the Pre-Approved List

Students wishing to count a graduate course at Carnegie Mellon not listed in the approved graduate course list, or an undergraduate course offered by another department at Carnegie Mellon, must formally petition the Graduate Studies Committee. Please see the section in this handbook on petitions and schedule an appointment with your academic advisor for more information.

Breadth Area Requirement

The ECE Department has defined 7 technical areas (plus an 'Other' area) as Breadth Areas for the Ph.D. degree. These areas are:

- Algorithms/Complexity/Programming Languages
- Applied Physics (Solid State/Magnetics/Fields)

- Artificial Intelligence, Robotics and Control
- Circuits
- Computer Hardware Engineering
- Signal Processing and Communications
- Software Systems and Computer Networking
- Other (by petition)

Each Ph.D. candidate must take at least one [1] graduate class from at least three of these areas to fulfill the breadth requirement. Students must receive a "B-" grade or better in these courses.

By petition to ECE's Graduate Studies Committee, students may be able to count one course that they have taken during a previous degree toward the breadth course requirement. If the petition is accepted, only two more breadth areas must be satisfied. However, students will still be held to the same course requirements.

Qualifying Exam Requirement

Students who are working towards a Ph.D. degree are required to take the Ph.D. Qualifying Examination. The Ph.D. Qualifying Examination tests the student's ability to think, speak, and write. Students must read and understand three technical papers that define the examination topical area. Students then write a review paper as well as orally present this review to a faculty examining committee. This committee includes three faculty members from the ECE department whose research focus is in the area the student wants to be tested on. The student must answer detailed questions from the faculty committee. These questions can be about the review paper and presentation, the reference papers, and obvious undergraduate-level technical background for the material in the review and reference papers.

Timeline

Fall exams generally occur in the month of November. Spring exams generally occur in the month of April.

The relevant Qualifying exam dates and the most important deadlines are published every semester on the Qualifying Exam webpage.

Full-time PhD students

Full-time students must take the Ph.D. qualifying exam for the first time no later than the fourth semester after being admitted to the Ph.D. program and must pass the exam no later than the fifth semester after being admitted to the Ph.D. program. Summer semesters are not included in this qualifying exam timeline.

The time clock determining when a student must take the qualifying exam is stopped for one semester if the student is engaged in an industrial internship during an academic-year semester (fall or spring). This policy applies for only one semester of internship. Students engaged in internships for more than one academic-year semester may submit a petition to request a deferment of the Qualifying Exam timeline beyond one semester.

The time clock determining when a student must take the Qualifying Exam is also stopped if students decide to take a Leave of Absence prior to the Qualifying Exam. Their time clock can stop for the entire length of their Leave of Absence. Leaves of absences are capped at two calendar years' time maximum throughout the Ph.D. program, accrued either as a 2-year leave or amount to 2 years accrued through various leaves

Part-time PhD students

Regardless of when they start the Ph.D. program (Fall 2015 or prior to Fall 2015), part-time students must take the Ph.D. qualifying exam for the first time no later than the seventh semester after being admitted to the Ph.D. program and must pass the exam no later than the eighth semester after being admitted to the Ph.D. program. Summer semesters are not included in this qualifying exam timeline. The time clock determining when a student must take the qualifying exam is stopped for one semester if the student is engaged in an industrial internship during an academic-year semester (fall or spring). This policy applies for only one semester of internship.

Deferment of Qualifying Exam

Students may **submit a petition** to request a deferment of the qualifying exam timeline beyond one semester. Please see the section 'Petition Process'.

Retake Qualifying Exam Committee Selection

Students who will retake the ECE qualifying exam will be notified of their test dates sooner. All students retaking the qualifying exam must list their original committee members (who are available) at the top of their faculty selection list, in order of preference as #1, #2, and #3. Additional details on how the Graduate Studies Committee (GSC) will select the retake committee can be found on the ECE Qualifying Exam Webpage.

Mechanics

Declaration, Abstract, and Technical Papers (due in September or February)

With faculty advisor input, the student will complete a qualifying exam declaration, write a presentation abstract, and submit three technical papers. The declaration will allow students to rank order between seven [7] and ten [10] ECE faculty that the student and his or her advisor feel would be the best fit for the examination committee. The three technical papers provide context to the faculty examining committee regarding the student's area of focus.

Students can choose no more than two papers that may have authors who are currently faculty at Carnegie Mellon. Students can choose no more than one paper that the student has co- authored. The total length of all three papers may not exceed 50 pages.

The Graduate Studies Committee reviews the declaration packets and recommends a three- person faculty examination committee. While every attempt is made to choose faculty from the student's declaration submission, these preferences cannot always be accommodated due to faculty availability and committee balancing. This committee is subject to approval by the student's faculty advisor.

Review paper (due in October or March)

The qualifying examination tests your written communication skills through a short review paper. This paper defines the focus of your qualifying examination topic. You should explain your technical area; your work and the relationship between your work and the content of the student's three technical papers. This paper must not exceed four pages and must be in a 2-column format.

Exam (occurs in November or April)

Prior to the start of the qualifying exam, the Academic Affairs Office will communicate each student's exam date, time, committee, and location via email.

The Qualifying Examination tests a student's oral communication skills by having the student present a short, conference-style talk during the first 30 minutes of a Qualifying Exam. The examining faculty will typically ask the student's questions to help clarify the presentation immediately following your presentation.

Once the clarification question and answers are completed, the examining committee will ask the student questions about the student's research area, technical papers, review paper, and electrical and computer engineering fundamentals that relate to your research area.

Outcomes

At the conclusion of the qualifying exam, the faculty examiners will consult with each other and grade the qualifying exam. All qualifying exams will be discussed at the faculty qualifying exam review meeting, which occurs on the Friday of the second week of qualifying exams. Final outcomes will be determined by the faculty at this meeting, not by the three-person faculty examination committee.

All students will be notified of their qualifying exam outcome and provided with feedback after the faculty has convened.

Students failing the qualifying exam the first time can take it a second time, no later than the sixth semester after being admitted to the Ph.D. program if the student started prior to Fall 2015 or the fifth semester if the student started in the Fall 2015 semester or afterwards. One faculty member from the first exam committee will serve on the second committee. A student who fails the exam

twice must leave the Ph.D. program at the end of the semester in which the second failure occurs.

Students who pass the qualifying exam will officially be recognized as candidates for the Ph.D. degree.

Research

All full-time Ph.D. students are required to complete research every semester they are enrolled in the program. The completion of research is represented by the student's enrollment in *18990 Reading and Research* each semester. Expectations for research and productivity vary greatly throughout the department and should be discussed regularly with the student's faculty advisor.

Every semester, ECE Ph.D. students are assigned a Satisfactory or Unsatisfactory grade for their research by their faculty advisors. One exception is in the PhD students' final semester when they are assigned a final letter grade.

Each fall and spring semester, students should register for *18990 Reading and Research* in the section that represents their physical location.

18990 Reading & Research sections:

- Section A: For students studying in Pittsburgh
- Section PP: For all CMU Portugal students studying in Portugal. (CMU Portugal students in Pittsburgh will register for section A.)

Resources and Regulations Governing Research at Carnegie Mellon that may be of interest to Ph.D. students include the following:

- Office of Sponsored programs
- Office of Research Integrity & Compliance
- Intellectual Property Policy
- Policy on Restricted Research Human Subjects in Research Policy

Students are expected to abide by the university's position on ethical research as posted on the Office of Research Integrity and Compliance website. See the **Responsible Conduct of Research Education** section in this handbook for more information.

Teaching Internship Requirements

All ECE Ph.D. students are required to complete two Teaching Internships ("TI") over the course of the Ph.D. program. These Teaching Internships are unpaid, and students will receive a letter grade reflecting their performance. Students must receive a "B" or better in the TI course to receive credit for completing the teaching internship.

The TI program is coordinated through the Academic Services Office. Please note that the application and hiring process is entirely managed through ECE's online TAPS system:

https://www.ece.cmu.edu/apps/taps/. All ECE students will receive an email each semester when applications open for the upcoming semester, typically around the date the Schedule of Classes is published.

All students must complete a teaching assistant application for the TI to be formally recognized by the department. The Academic Services Office will work with the student to enroll him or her in the correct course representing their work as a TI prior to the start of the semester. TIs will be registered for 18- 991 (12 units) to receive credit for their assignment.

ECE Doctoral students are allowed to TA in other departments, but not for TI credit. If students want to pursue a TA in other departments, and they have their faculty advisor's support, they will have to reach out to the two departments' Business Offices, which will have to work on the compensation logistic details. Students should contact the PhD Senior Academic Program Advisor, Greta Ruperto to facilitate this process.

Programs that are not based in Pittsburgh may have requirements pertaining to where each TI is completed. More information on location-specific requirements can be found below:

CMU | Portugal **Dual-Degree Program**	CMU | Portugal dual-degree students will complete one TI in Pittsburgh (Pa, USA) and one TI in Portugal.
CMU | Thailand **Dual-Degree Program**	CMU | Thailand dual-degree will complete one TI in Pittsburgh (Pa, USA) and one TI in Bangkok (Thailand).

Students are expected to support the course instructor and establish mutual expectations while providing excellent academic support to students. Depending on a student's area of expertise and English proficiency, he or she may be assigned to a variety of tasks that can range from grading to leading recitations.

Teaching Assistant Training Workshops

https://www.ece.cmu.edu/insider/teaching-opportunities.html

ECE is committed to providing a high level of teaching excellence and ensuring a positive student learning experience. When serving as Teaching Assistants for ECE courses, students are extensions of the department charged with representing these values. Students are therefore required to complete training during the first semester in which they are hired to work as a TA. The TA training is not part of ECE degree requirements but is necessary to serve as an ECE TA. It is also separate from the language certification and language workshops offered by the Student Academic Success Center which may also be required. Once a student has fulfilled the training requirement, participation is not required again. If a student has served as a TA previously but has never completed the training, it will be required before beginning the next ECE assignment. Hired Teaching Assistants will be contacted about the training requirements prior to the start of classes. Students are expected to plan their time accordingly.

Teaching Assistant Positions

There are several levels of teaching assistant opportunities available for ECE students. For complete information, please visit the Teaching Opportunities website:
https://www.ece.cmu.edu/insider/teaching-opportunities.html

Evaluation and Certification of English Fluency for Instructors

Graduate students are required to have a certain level of fluency in English before they can instruct in Pennsylvania, as required by the English Fluency in Higher Education Act of 1990. Through this Act, all institutions of higher education in the state are required to evaluate and certify the English fluency of all instructional personnel, including teaching assistants and interns. The full university policy can be reviewed here.

The fluency of all instructional personnel will be rated by Language Support in the Student Academic Success Center to determine at what level of responsibility the student can TA. In addition to administering the International Teaching Assistant (ITA) Test (a mandatory screening test for any non-native speaker of English), Language Support in the Student Academic Success Center helps teaching assistants who are non-native English speakers develop fluency and cultural understanding to teach successfully at Carnegie Mellon. Visit the Student Academic Success Center website for additional information.

Prospectus

All Ph.D. students registered full-time are required to prepare a thesis prospectus (also known as a proposal) within **four** semesters following the successful completion of the Ph.D. Qualifying Examination. Part-time students must propose within six semesters following the Qualifying Examination.

This time clock begins with the semester following the Qualifying Examination. A calendar year has

three semesters (Spring, Summer, and Fall). If a student leaves for a semester to return to industry, this four-semester clock is stopped. However, the time clock for the overall PhD program is not stopped. The Ph.D. prospectus clock stops when the student leaves and resumes at the start of the semester when the student returns. Students who have not met their Ph.D. prospectus requirement within the four-semester time limit must discuss a revised timeline with their advisor prior to the semester's Graduate Progress Review faculty meeting.

Prospectus Description

The prospectus is both 1.) an informal written description of the problem to be investigated and the expected accomplishments of that investigation; and 2.) an oral presentation to the Prospectus Committee for its review and recommendations. Both prospectus requirements must be completed at least one semester prior to the final defense.

Prospectus Format

The Ph.D. prospectus write-up should be no more than 25 double-spaced pages in length, although prospectuses that are on the order of five to ten pages are encouraged. The prospectus should include the following:

- An explanation of the basic idea of the dissertation topic;
- An explanation as to why this topic is interesting;
- A statement as to what kind of results are expected, and;
- A convincing argument as to why the results are attainable in a reasonable amount of time
-

Furthermore, the prospectus should not be:

- A summary or abstract of the dissertation;
- The first chapter or part of the dissertation;
- A technical report;
- A survey of the field, or;
- An annotated bibliography

Students should discuss the presentation format of their prospectus with their faculty advisor. Typically, a student is expected to provide a 45- to 60-minute presentation on their prospectus, and then participate in a question-and-answer-based discussion with their committee.

A prospectus template can be found on the ECE Prospectus webpage.

Prospectus Committee

The Prospectus Committee consists of at least four members, including the student's faculty advisor. At least two members of this committee must be ECE faculty and at least one member must be from outside the department. Faculty members from other departments who hold courtesy appointments in ECE are considered to be “inside” the department. Faculty members who hold an adjunct appointment are considered to be “outside” members. All committee members must hold a doctoral degree.

All committee members must actively participate in both the prospectus meeting and Defense. While it is desirable to have all committee members participate in person, at least three committee members must be physically present, while the remaining can be remote. Any deviation from this teleconferencing policy is exceptional and must be petitioned for approval from the department via the PhD Prospectus Form. Because of the nature of the ICTI dual-degree program, teleconferencing requests by ICTI students will be approved by default.

It is expected that any committee members participating remotely will have full audio and visual access to the presentation via teleconferencing equipment. It is the responsibility of the student to provide teleconferencing access to committee members participating remotely. Students can email help@ece.cmu.edu for assistance in setting up teleconferencing equipment.

Please note that all of the faculty being remote is not sufficient to justify the student being remote. The student is expected to be on campus (whichever campus they register at) for the prospectus presentation. If the student plans to be remote for either the prospectus or defense, they must petition the GSC for permission, fully explaining their circumstances.

Prospectus Procedure

To initiate the prospectus process, students must complete and submit the Prospectus Declaration Form (Google Form). This form must be submitted at least two (2) weeks prior to the anticipated prospectus date to allow sufficient time for review by the Senior Academic Advisor, Greta Ruperto, and the Graduate Studies Committee (GSC). Students are encouraged to submit the form as early as possible, even if the exact date of the prospectus has not yet been finalized. An approximate timeframe (e.g. "last week of the Spring semester") is acceptable, provided that all other require committee and exam details are known.

Students will be notified by Greta Ruperto, PhD Senior Academic Program Advisor, of the approval of their committee. Once the committee has been approved, the student may proceed with the prospectus presentation. To encourage open and frank dialogue, this presentation is attended only by the student, the committee, and any other interested ECE faculty members. Other attendees must be approved by the committee chair.

The outcome of this meeting will be either that the prospectus is accepted or not accepted. Following the prospectus presentation, committee members are asked to endorse the Prospectus Committee Form. A committee member's signature on the form confirms approval of the prospectus. In some cases, committee members may request revisions or additional changes to the prospectus before providing endorsement. The prospectus requirement is considered complete once all required

signatures have been obtained on the Prospectus Committee form. The Senior Academic Advisor, Greta Ruperto, will coordinate the collection of signatures and notify the student once the process has been completed.

Milestone Review

Upon completion of the prospectus proposal, the Senior Academic Advisor, Greta Ruperto, will notify the student via email confirming that the prospectus requirement has been completed. If the student has satisfied all degree requirements except the thesis defense, the student may be informed of their eligibility for All But Dissertation (ABD) status. If additional requirements remain outstanding, the student should schedule a meeting with the Senior Academic Advisor to review their degree progress.

All But Dissertation Status Declaration

Once a student has completed all program requirements, with the exception of the thesis and defense, the student is required to go on All But Dissertation (ABD) status. Two ABD options are available to students:

- ABD in Residence (ABD): Students will continue enrolling for 36 units each semester and will continue to receive stipend support. Students continue to be responsible for paying the activity and transportation fee. During their final semester, students' faculty advisors might be eligible for tuition reimbursement. Please note that tuition reimbursement is dependent on the date that the student's degree is certified and is only applicable to research units (18990). If students register for courses other than research (18990) during their final semester, they will be financially responsible for those courses, as they are not being used toward the PhD degree requirements.

- ABD in Absentia (ABS): students stop enrolling at CMU and no longer receive tuition or stipend support. The student will be responsible for paying the technology fee each semester he/she is ABS. When the student is ready to come back and defend, he/she will notify the Academic Affairs Office, which will work with the student to re-enroll him or her in ECE. The student will be responsible for registering for and paying for 5 units of *18990 Reading and Research* as well as all fees. Please note that international students may face additional constraints before going ABS and should consult with the Academic Affairs Office to obtain more information.

The full university Policy for Doctoral Status is a series of policies that set forth a definition of All But Dissertation (ABD), time limits on doctoral candidacy status, a definition of *in residence* and *in absentia* status for ABD candidates and the tuition charged for candidates in each status.

The ABD status agreement form and ABD status change form can be found on The HUB's Forms & Guides website under the 'Student Records' section.

Ph.D. Dissertation

Once the student has completed all research that was agreed upon at the prospectus meeting, they must write a PhD thesis and orally defend it.

ECE adheres to CIT's policy on PhD completion timelines. The CIT policy is as follows: "Passing the PhD Qualifying Examination admits a student to candidacy for the PhD degree for a period of no longer than six calendar years. If, at the end of this six-year period, the PhD has not been awarded, the student must reapply for admission to the graduate program and will be judged competitively with other students applying at the same time." Students wishing to obtain an extension due to special circumstances must submit a formal petition at least one semester prior to the expiration of their defense timeline. Please note that CIT's policy is more restrictive than the university-wide policy, which allows a maximum of ten years from the original matriculation as a doctoral student to complete all Ph.D. requirements.

Once the Ph.D. thesis is written, students must initiate the defense process by filling out the Thesis Defense Google Form. This form guides students through the essential pre-defense steps, including the submission of several key pieces of information necessary for the defense. To initiate the process, please reach out to Greta Ruperto, PhD Senior Academic Program Advisor. The PhD Senior Academic Program Advisor will provide students access to the Thesis Defense Google Form. Students must complete the Thesis Defense Google Form at least two weeks before the student's defense date. The Thesis Committee is usually the same as the Prospectus Committee. If there is any change in the committee, the student must submit a biographical description of any new committee member from outside Carnegie Mellon for approval. Additionally, students are expected to adhere to Carnegie Institute of Technology (CIT) guidelines on providing defense committees with a copy of the thesis prior to the defense. CIT recommends that students provide their committee with a copy of the thesis at least 1.5 months prior to the defense.

The oral defense is a public examination open to all members of the Carnegie Mellon community. All the members of the student's Prospectus Committee must actively participate in the defense meeting. It is desirable to have all committee members participate in person; however, a student is allowed to have one committee member participate remotely by teleconferencing. Any deviation from this teleconferencing policy must be requested via the Thesis Defense Google Form.

Students will not be eligible to participate in any commencement ceremonies until their degree has been formally certified by the ECE Department.

Due to the nature of the ICTI dual-degree program, teleconferencing requests by ICTI students will be approved by default.

It is expected that any committee members participating remotely will have full audio and visual access to the presentation via teleconferencing equipment. It is the responsibility of the student to provide teleconferencing access to committee members participating remotely. Students can email help@ece.cmu.edu for assistance in setting up teleconferencing equipment.

In addition to these ECE requirements, CIT has its own requirements pertaining to the thesis and

defense process. This site includes instructions for the document standards and format. Students should pay particular attention to the format of the thesis title page and the required content of the acknowledgements section.

Per CIT requirements, all defenses should be completed at least two weeks prior to the final grade deadline of a given semester. Doing so should grant students sufficient time to make necessary revisions and complete all post-defense paperwork prior to the end of the semester. Any deviation from this timeline is discouraged and may hinder a student's ability to graduate on time. Such deviation from the cited timeline may be subject to additional departmental approval and should be discussed with the Academic Affairs Office well in advance of the planned defense.

Please note: Students who **do not** successfully complete the dissertation, defense, and all defense-related paperwork prior to the final grades deadline of a given semester may be required to register for the following semester, and thus the faculty advisor will be responsible for supporting the student for an additional semester with tuition and stipend.

After the defense, the Academic Affairs Office will review additional paperwork that will need to be completed prior to a student's degree certification with the student.

Departmental Progress Reviews

All students working towards a Ph.D. degree must regularly demonstrate progress towards meeting the ECE Ph.D. requirements by completing a Graduate Progress Review Statement each fall and spring semester.

In this statement, the student must describe his or her:

- Activities as a graduate student researcher;
- Research goals and achievements;
- Activities as a member of the ECE community;
- Courses taken since enrollment as a graduate student in ECE, and;
- Plans for the following semester

These statements are typically due during the first week of November (fall semester) and April (spring semester). Students are encouraged to discuss the completed statement with their advisor.

Students who have passed the qualifying exam will also be asked to create a single-slide summary of his or her progress towards the ECE Ph.D. degree.

The Graduate Progress Review Statement and slide summary inform faculty discussions during each semester's Graduate Progress Review meeting. The outcome of this review is a grade that characterizes the student's progress towards the Ph.D.: satisfactory ("S") and unsatisfactory or not passing ("N"). Students who receive an "N" grade for the first time must meet with their advisor and define a course of action to achieve a satisfactory grade in the next semester. Students who continue

to make inadequate progress towards the ECE Ph.D. may be subject to dismissal.

Ph.D. students do not receive a letter grade for their research each semester with one exception: students will receive a letter grade in their final semester as a graduate student in the ECE Department or prior to receiving an MS degree on the way to the Ph.D.

All students will receive a letter from their faculty advisor each fall and spring semester summarizing their progress and offering suggestions for improvement or continued success. This letter is typically distributed by the final grade deadline of the fall and spring semesters.

Internships Course Option

ECE students may wish to participate in paid internships at off-campus organizations during the summer months or the academic year. ECE will enroll all students who are pursuing an internship for the appropriate 3-unit credit-bearing internship course. In order to be enrolled into the ECE PhD Internship courses, students must first gain the sponsorship of an ECE faculty member to serve as an internship supervisor by completing the Internship Enrollment Request Form.

Eligible international students who are interested in pursuing off-campus internships must meet with departmental and OIE representatives for eligibility for work authorization before starting or seeking an internship/co-op or consulting opportunity. International students will benefit from proactively reviewing OIE guidance regarding off-campus work authorization. Off-campus work authorization processing times can take several weeks or months, and international students will benefit from starting the off-campus work authorization process as early as possible.

For additional information, please refer to OIE's website on Employment Options for international students. Academic and OIE advisors will provide students with information about CPT during the spring semester.

For additional guidance and information on internship opportunities and requirements, students should contact their academic advisor.

Summer Internships

Students conducting an internship in the summer semester (part-time or full-time) will be registered for one of the following courses, depending on the number of summer internships they have already completed:

- **18-996**: First summer internship
- **18-997**: Second summer internship
- **18-998**: Third summer internship

These internships will appear on the student's transcript. Ph.D. students typically are not charged for summer tuition, including the internship course. However, if a student takes another summer class, summer tuition may be assessed for the summer internship course as well. Students should contact their academic advisor and reference CIT's current cost of attendance website for details. The work for the internship must be appropriate to the goals of the academic program, and units can be applied toward the Ph.D. Course Requirement.

Academic Year Internships

Students conducting a part-time internship (20 hours/week) during the academic year will be registered for one of the following new courses, depending on the number of academic year internships they have already completed:

- **18-986**: First part-time academic year internship
- **18-987**: Second part-time academic year internship
- **18-988:** Third part-time academic year internship

Enrollment in the fourth part-time academic year internship requires approval from both the faculty advisor and the ECE Graduate Studies Committee (GSC), which will assess the necessity of the internship in relation to the student's research and thesis progress.

Internship Assessment and ECE Internship Faculty Supervisor

ECE Internship courses will not meet at a regularly scheduled time; rather, students will learn independently through practical work experience, gaining insight and knowledge in their field of study. The student's growth and education will be assessed via the student's completion of an Internship Experience Review Report.

- The Internship Experience Review Report will be overseen and graded by an ECE Internship Faculty Supervisor of the student's choice.
    - Supervising faculty must have a primary or courtesy appointment with ECE.
    - While the ECE Internship Faculty Supervisor may also be the student's faculty advisor, it is not necessarily required for the student's faculty advisor and the ECE Internship Faculty Supervisor to be one and the same.
- The ECE Internship Faculty Supervisor will assign a grade based on the depth and thoughtfulness of the student's reflections on the internship experience.
- Completion of this report will be a requirement of this course.

POST-MATRICULATION GUIDELINES

Return of University Property

ECE students must return all borrowed ECE and university materials—such as software, manuals, library books/materials, or any other Carnegie Mellon University property—prior to their departure from the program.

Career Services Employment Outcomes

ECE students are asked to complete and return a survey for Career Services updating CMU on their employment outcomes after graduation. Information about the survey is communicated in the students' final semester.

"Grandfather" Clause

When policies are changed, it is because the department believes the new rules offer an improvement; any such changes will be communicated to students. In case degree requirements are changed and certain courses are no longer offered, the department will try to find some compromise that allows those students to satisfy the original requirements.

TUITION, FEES, FINANCES, & FINANCIAL SUPPORT

Purchasing & Reimbursements

At ECE, most purchasing actions, including airline tickets, are conducted by administrative departmental employees rather than a central purchasing authority. Buyers are encouraged to purchase goods and services from the administrative coordinators and not use their own funds. If you use your own funds and they charge tax, you will not be reimbursed for the tax applied to the purchase. All purchases including travel which are done on CMU's behalf need to have the direct approval of the faculty member or PI of the project.

The preferred method of making travel arrangements is through one of the university's preferred travel agencies with which the administrative coordinator can provide assistance. By purchasing the tickets through these agencies, the cost of the tickets is charged directly to the university instead of the student or employee paying the cost personally and needing to be reimbursed.

The administrative coordinators also will complete a reimbursement for any items or travel accrued.

Please keep in mind that you must provide transaction-supporting documentation in accordance with Carnegie Mellon requirements and government policies on reimbursements. Expense reports must be submitted within 90 days after completing the travel or incurring the expense, otherwise, the reimbursement will be treated as taxable income to the individual. Please see the administrative coordinator to arrange for travel and purchasing, as well as reimbursements.

All purchases of goods, services, and equipment using University funds by charging directly to an account string, including restricted accounts and research grants and contracts, should be made at the direction of a CMU faculty or staff member. Only certain department staff members are able to confirm an order with an outside vendor. Please plan ahead. Rush orders for pick-up or delivery and orders of over $1,000 are difficult to accommodate.

Basic office supplies are purchased by the Administrative Coordinators for general use by ECE students, faculty, and staff. Teaching Assistants should speak to an Academic Services Assistant for research- and teaching-related supplies.

Questions should be directed to the ECE Business Office, located in HH 1110. Please visit CMU's Procurement Services website for more information.

Graduate Student Reimbursement Policy

Business Expenses

As an educational institution, CMU is exempt from Pennsylvania state sales tax. Whenever possible, business purchases should be made by your faculty advisor's Administrative Coordinator or by another faculty or staff member with a tax-exempt purchasing card.

If it is necessary to make a purchase using personal funds, legitimate business expenses can be reimbursed by the department. Your faculty advisor's Administrative Coordinator will help you claim reimbursement provided you have the following:

- Receipt indicating item purchased and proof of payment
- Business purpose for purchasing item
- Account to be charged for reimbursement
- Faculty or staff approval

Please consult with the appropriate Administrative Coordinator prior to incurring the expense for additional instruction. Software purchases in particular should only be made after consulting with a departmental staff member, as the purchase will often require approval from the University Contracts office due to the popularity of Click-Through Agreements ("CTA"). If personal funds are used to make a business purchase requiring a CTA without prior approval from Contracts, it is possible that the expense in question will not be reimbursable.

Travel Expenses

If agreed on in advance with your advisor or with another departmental staff member, legitimate travel expenses can be reimbursed by the department. Your advisor's Administrative Coordinator will help you claim reimbursement once you provide the following:

- Hotel receipts must show a zero balance with proof of payment and your name
- Receipts for meals must be collected, unless you claim per diem meals; both daily meals and per diem meals cannot be claimed for the same travel expense report. Current per diem rates can be verified on the GSA website.
- Personal car mileage for business purposes; standard mileage reimbursement rates for gas/fuel but not tolls
- Business purpose for travel
- A program or agenda, when available
- Account to be charged for reimbursement

- Approval by an ECE faculty or staff member

Conditions

Tax will be reimbursed for expenses incurred due to normal business related travel (hotel, airfare, meals) but **not** for miscellaneous expenses, such as the purchase of a replacement mouse for a department laptop, poster board for a presentation, etc., purchased while traveling or preparing for travel. These items should have been purchased through a department approved buyer thus not incurring tax expense.

Academic Year Tuition & Stipend

Research assistantships are provided by research projects which are funded by government agencies, private industries, and consortia. Students who are research assistants will be expected to conduct appropriate research under the direction and guidance of their faculty advisor(s). Tuition and stipend support is renewable based on a student's acceptable performance in course work and research and the faculty advisor's funding availability.

In most situations, as long as the student is in good academic standing (with regard to grade average, progress in the program, and length of time in the program), full tuition remission will be given.

For the academic year 2024-2025, this tuition is valued at approximately $50,000. Students are responsible for the costs of purchasing their own books and miscellaneous supplies. A listing of estimated cost of attendance is provided for student use, with tuition increasing approximately 3% per academic year to account for inflation. Total charges for a period of attendance and estimated schedule of total charges for entire educational program can be found at the following website: https://www.cmu.edu/sfs/tuition/graduate/cit.html

Unless noted otherwise, stipend payments will be disbursed twice a month (semi-monthly) following the academic year cycle (August 16th through August 15th each year). Payment occurs once in the middle of the month and once on the last working weekday of the month. Exact pay dates are available on the CMUWorks Payroll Resources website (see Graduate Student - Semi- Monthly - Pay Date).

The monthly stipend amount for all Pittsburgh Ph.D. students is equal to $3,455 for the 2024- 2025 academic year.

Stipend amounts are reviewed each year and augmented according to increases in cost of living. Such increases will be communicated to students in the spring semester prior to the following academic year.

Summer Semester Tuition & Stipend

Students supported by the ECE department are expected to continue working over the summer in some capacity, either via research on campus or through an off-campus internship. Students will continue to be compensated at the same stipend rate paid during the academic year if they are working on campus. Stipend payments will be suspended if the student is doing an off- campus internship or has failed to register for the summer semester.

Tuition is not assessed during the summer semester if the student is registered for *18990 Reading and Research*. Registration for other courses may trigger a tuition charge for which the student will be responsible to pay unless prior arrangements have been made with the student's faculty advisor. It is the student's responsibility to understand the financial repercussions of his or her summer registration.

Losing, Reducing, or Changing Funding

If a student is supported by the department through an external grant or contract, and this funding is lost, reduced, or changed, the advisor will notify the student accordingly. All efforts will be made to facilitate the student's continuation in their degree program, if he or she is progressing satisfactorily in the program. Students who are not progressing satisfactorily may receive a dismissal letter. The dismissal process is outlined in the "Satisfactory Progress and Program Dismissal" of this handbook. More information about becoming self-supporting is contained in the following section.

Self-Supporting Students

With few exceptions, almost all Ph.D. students in the ECE department are funded through the department or a third party entity. Students are typically not allowed to self-support. One exception to this requirement is that, occasionally, students who are in All But Dissertation (ABD) status must become self-supporting due to a change in an advisor's funding situation and/or because of other factors.

Per CIT's In Residence Status for ABD Candidates policy (under 'All but dissertation status' section):

"Under exceptional circumstances, ABD students who are self-supported, and who can demonstrate financial hardship, may petition the College through the departments for permission to register for 5 units of thesis research per semester." The exceptional circumstances for such approval include:

- Self-supporting with demonstrated financial hardship
- At least three years of full time student status
- Good standing and progress towards a degree
- No more than two semesters of required work; ABD with In Residence status and 5 units of tuition per term will not be allowed for more than two semesters of work, where a summer is considered to be one semester."

Students should submit a fully-endorsed self-supporting application to the Academic Affairs Office prior to the 10th day of class in the semester in which they are becoming self-supporting. If the student has not completed the degree program after two self-supporting semesters, and no additional funding from the faculty advisor is available, the student will have the option of going ABD in absentia, taking a leave of absence, or withdrawing from the ECE Ph.D. program.

Fees

ECE will pay for each student's technology fee as long as the student is enrolled as a full-time student or is under All But Dissertation in Residence (ABD) status. If a student moves into ABS absentia status, the student will be responsible for paying for the technology fee each semester while under absentia status, including the semester in which the student returns to defend their dissertation. **When a student returns from ABD in absentia to defend, he or she will be responsible for paying for all fees and tuition assessed.**

Students are responsible for paying the Student Activities Fee and the PAT Transit Fee. Students are encouraged to check their SIO regularly to ensure that all outstanding balances are addressed.

The technology fee and tuition are paid over eighteen monthly installments (August 16th - May 15th). The process decreases the student account balance incrementally over the academic year such that the tuition balance reaches zero in the middle of May.

Health Insurance

CMU requires all graduate students to enroll in the University's health insurance program unless covered as a dependent elsewhere, in which case an insurance waiver must be completed. Visit https://www.cmu.edu/health-services/student-insurance/ for more information. If you elect to enroll in Carnegie Mellon University's Student Health Insurance Plan (SHIP), the University will cover 100 percent of the premium cost for your individual coverage under SHIP. While you will have the opportunity to purchase partner, spouse or dependent coverage under the SHIP plan, the University's support will be limited to the individual coverage amount. Please note that if you wish to elect the required health insurance coverage under an alternate plan, you will not be eligible for the University support referenced here. In order to be eligible for the financial support, you must enroll in the SHIP. Any questions regarding health insurance payments can be addressed to the HUB at https://www.cmu.edu/hub/

Conference & Travel Funding

As a department, ECE does not provide centralized travel or conference funding. However, students are encouraged to talk to their faculty advisor(s) about travel or conference funding. The Office of the Assistant Vice Provost for Graduate Education does provide some conference funding via an application process. Conference funding is a funding application process provided by GSA and the Provost's Office for students, student work groups, or groups to attend a conference, whether as a

participant or as a presenter. The process is managed by the Graduate Education Office. Students can find more information about the application process and deadlines at https://www.cmu.edu/graduate/professional-development/index.html.

Additional Sources for Financial Support

Office of the Dean of Students Emergency Support Funding

Graduate students who find themselves in need of immediate funds for emergency situations should contact the Office of the Dean of Student Affairs (see Appendix A), https://www.cmu.edu/student-affairs/index.html, to inquire about the types of emergency funding available to enrolled students.

Fellowships

Students who are interested in applying for external fellowships should see their advisor or check the online information provided by the Office of Scholarships and Fellowships website. The website is an excellent resource for locating an abundance of information regarding available funding for students. Additionally, fellowship opportunities will be announced periodically over the course of the academic year by the department. While students can apply directly to some of these fellowships, most require an internal competition to identify top students for nomination. Students are encouraged to monitor the ECE Fellowship Opportunities website for active fellowships.

Please note that the external fellowship will be applied toward your tuition, fees, and stipend before departmental financial support is applied. In the event that a student is awarded an external fellowship that does not cover the full amount of the student's tuition, fees, and stipend, the faculty advisor will supplement the external fellowship up to the standard amount of funding that all Ph.D. students in the ECE department receive.

GuSH Funding

GuSH Research Funding is a source of small research grant funds provided by GSA and the Provost's Office and managed by the Office of the Assistant Vice Provost for Graduate Education. Students can find more information about the application process and deadlines at https://www.cmu.edu/graduate/professional-development/research-funding/index.html.

Payroll

Other questions concerning payment options should be addressed to the ECE Business Office in HH 1110.

CAREER SERVICES

The Career and Professional Development Services Center (CPDC) serves to provide students with guidance during their job and internship searches. The services available to students include resume reviews, mock interviewing, salary negotiation, career exploration consultation, internship and job consultation, workshops/events and employer relations. The CPDC is also heavily involved in organizing campus-wide job fairs and bringing employers to campus.

Handshake is Carnegie Mellon's online recruiting system. Through Handshake, employers can request accounts to post jobs, request interviews and information sessions, and review student resumes. Students and alumni can apply to positions, sign up for interviews and find contact information for thousands of recruiters. Handshake can be accessed through the CPDC website.

Career Consultants

ECE has assigned career consultants who provide guidance through one-on-one appointments. Students in Pittsburgh can meet with career consultant Marcie Foy. Appointments with Marcie and can be made through Handshake. They will each also hold open office hours, which will be communicated at the beginning of each semester.

Job Search Guidelines

ECE strives to play a supportive role in the career pursuits of students, but maintains academics as a priority. It is not acceptable for students to skip classes or assignments in order to attend job interviews. Students should conduct job searched in a manner that does not impede academic progress through their graduate program.

It is also important for students to have an understanding of how to conduct a job search. When applying for jobs, students are expected to exhibit certain ethical behavior, such as arriving on time for interviews, being truthful about their qualifications, and to honor their agreements with recruiters. Further, students should not continue looking and interviewing for a position after they have accepted an offer.

The CPDC reserves the right to limit access for any users that do not follow CMU's ethical job/internship search policy. Students who do not follow such guidelines may forfeit their on-campus interviewing and/or resume submission privileges.

CMU First Destination Outcomes

Post-Graduation Salaries and Destination Information can be found at the following link:

https://www.cmu.edu/career/outcomes/post-grad-dashboard.html

Employment with ECE Department

Eligible international students who qualify for pre- or post-completion Optional Practical Training (OPT) work authorization should note that the ECE department (as an employer) does not offer unpaid positions for OPT work authorization. While off-campus employment or volunteer opportunities under OPT work authorization do not have to be paid positions, ECE will only offer paid positions to eligible students

Outside Employment

ECE follows CIT guidelines on outside employment (under 'Graduate Student Consulting'). Full- time students in ECE are expected to devote their full-time to research, teaching, and coursework per the compensation students are receiving via the stipend during the academic year.

Occasionally, there are employment opportunities offered to students that will enrich their research, coursework, and teaching. In these situations, students should consult with their faculty advisor regarding the opportunity and how it may impact their academic progress. Prior to accepting a position, students must receive written permission from both the faculty advisor and academic program advisor. Full-time students will be expected to keep up with their full-time research commitments even while employed outside of CMU. Students may consider taking a leave of absence to pursue full-time employment; however, this should be discussed with the student's advisor(s) and the Academic Affairs Office prior to the student deciding to take a leave.

Please note that international students have additional constraints on their eligibility to pursue employment outside of CMU. OIE provides additional information on employment options for international students on their website. International students are responsible for ensuring that their work authorization is valid and up to date.

ADDITIONAL DEPARTMENT & UNIVERSITY POLICIES/PROTOCOLS

Suspension/Required Withdrawal Policy

University suspension is a forced, temporary leave from the university. A student may be suspended for academic, disciplinary, or administrative reasons. Additional information is available at the following link: https://www.cmu.edu/policies/student-and-student- life/suspension-required-withdrawal-policy.html

Withdrawal from Program

Students are able to withdraw from the department at any time. Prior to withdrawing, students should discuss their decision with their faculty advisor(s) and the Graduate Affairs Office. Students will be required to fill out the Withdrawal form located on The Hub website. International students must consult with OIE before filing a withdrawal form as there will be visa repercussions.

Review/Redress of Academic Conflicts

Students are expected to discuss any concerns or conflicts initially with the faculty or staff member(s) involved, as well as their ECE academic advisor, Greta Ruperto (gruperto@andrew.cmu.edu). Students are strongly encouraged to seek informal resolution of conflicts through consultations with their academic advisor.

If a resolution cannot be reached through these initial conversations, the academic advisor will reach out to ECE's Associate Department Head for Students or ECE's Associate Department Head for Academic Affairs to seek their assistance with an informal resolution within the ECE Department.

If a conflict cannot be resolved informally a student may submit a formal written grievance to the ECE Department Head. Students who are interested in pursuing this process should discuss this with their academic advisor, Greta Ruperto (gruperto@andrew.cmu.edu). Once a formal grievance has been submitted, the Department Head or designated committee will issue a written decision on the grievance within thirty (30) days or as soon thereafter as practical.

If a department level resolution cannot be reached, please reference the General Graduate Policies for more information about the College of Engineering's process for the resolution of grievances.

If a department or College level resolution cannot be reached, students can reference the Office of Graduate and Postdoctoral Affairs' Summary of Graduate Student Appeals and Grievances Procedures. These appeal and grievance procedures apply to all students in graduate programs at the University.

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