

# Carnegie Mellon University

## Electrical & Computer Engineering

### MS Student Handbook – Silicon Valley

Department of Electrical & Computer Engineering

Academic Year 2024-2025

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## 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 2024 *US News and World Report* ranked our graduate programs in electrical engineering and computer engineering 7<sup>th</sup> and 5<sup>th</sup> 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
- The College of Engineering's Handbook
- University-Wide Graduate Student Handbook (Office of Graduate & Postdoctoral Affairs)
- The Word Student Handbook

Information about The Word, the student handbook, the Office of Graduate and Postdoc Affairs, the Office of the Dean of Student Affairs and others are included in Appendix A of this handbook.

Please do not hesitate to contact us if you have any questions or comments.

Sincerely,

A handwritten signature in blue ink, appearing to read "L. Pileggi".

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 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.

## Vision

Carnegie Mellon University will have a transformative impact on society through continual innovation in education, research, creativity, and entrepreneurship.

## Mission and Objectives

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.

Students in the Master's of Science in Electrical and Computer Engineering program are provided with a thorough background in the fundamentals of electrical or computer engineering, as well as the opportunity for in-depth specialization in some particular aspect of these fields. Upon enrollment in the department, students are given the opportunity, with the help of an academic advisor and faculty mentor, to choose an educational program that is consistent with their background and is best suited to their own academic goals.

The Master of Science in Software Engineering (M.S.-SE) is a unique program offered exclusively at CMU's Silicon Valley campus. It emphasizes a rigorous foundation in the core disciplines of software engineering. The program offers students a first-hand experience in software engineering by balancing theory and practice, engaging them in active learning, and encouraging collaboration on projects drawn from real world contexts.

Our students enter the program with a strong foundation in computer science. They leave the program with a deep knowledge of software engineering.

## 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 Study \*

- Pittsburgh
- Silicon Valley

Master of Science in Electrical and Computer Engineering – Advanced Study

- Pittsburgh

Master of Science in Electrical and Computer Engineering – Applied Advanced Study \*

- Pittsburgh

Master of Science in Software Engineering – Standard Program

- Silicon Valley

Master of Science in Software Engineering – Applied Study\*

- Silicon Valley

Master of Science in Artificial Intelligence Engineering – Electrical and Computer Engineering

- Pittsburgh

Doctor of Philosophy in Electrical and Computer Engineering

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

Please note: The instruction for all degrees and programs will occur in English.

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\* Available to students matriculating Fall 2020 to Spring 2023



## Graduate Student Catalog/Handbook

This catalog/handbook is intended to set guidelines and expectations for new and current Master's students in the Department of Electrical and Computer Engineering at Carnegie Mellon University Silicon Valley. This catalog/handbook is not exhaustive and is subject to revision at any time by the ECE department. It covers Master's students in Silicon Valley.

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 Advising and Academic Services Center.

## DEPARTMENTAL INFORMATION

### Personnel

Throughout a student's time in the MS 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 MS 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](#)
- Interim Director, CMU-Africa: [Professor Conrad Tucker](#)
- 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](#)
- Director of Finance and Sponsored Research: [Charlotte Ambrass](#)
- Director of Admissions and Academic Affairs: [Tara Moe](#)
- Director of Advising and Academic Services: [Megan Oliver](#)
- Ph.D./M.S. Senior Academic Program Advisor in Silicon Valley: [Brittany Bristoll](#)

A general [list of contacts](#) can also be found on the ECE website.

### Department Resources

#### Course Instructors

ECE courses are taught by world-renown educators and researchers.

[Hakan Erdogmus, Teaching Professor](#)

Ph.D., Telecommunications, Université du Québec

[Cecile Peraire, Associate Teaching Professor](#)

Ph.D., Computer Science, Swiss Federal Institute of Technology

[John Shen, Professor](#)

Ph.D., Electrical Engineering, University of Southern California

[Leonardo da Silva Souza, Assistant Teaching Professor](#)

Ph.D., Computer Science, Pontifícia Universidade Católica do Rio de Janeiro

[Rafal Wlodarski, Assistant Teaching Professor](#)

Ph.D., Lodz University of Technology

#### Academic Advising

Each student will have an *academic advisor* and a *faculty advisor*, listed in students' SIO portal, who work together as a team to best support their advisees.

The academic advisor is the main point of contact and a skilled staff member who serves as students' primary support in navigating their academic program. Academic advisors handle

crucial compliance-related advising tasks, including tracking degree progress, certifying graduation, and completing enrollment and university-related paperwork. The academic advisor in Silicon Valley is **Brittany Bristoll**.

The faculty advisors are full-time, PhD-trained faculty members who can help students with things like technical questions, course selection, career guidance, finding research projects, working with instructors, and more. The faculty advisors are Professor Hakan Erdogmus, Professor Cécile Péraire, Professor Leonardo da Silva Sousa, and Professor Rafal Wlodarski.

The head of the ECE Advising Group is Professor Tamal Mukherjee, Associate Department Head for Students, who also serves as a faculty advisor. Megan Oliver, Director of Advising & Academic Services, reports to Professor Mukherjee.

Concerns and conflict with your academic advisor can be shared with the Director of Advising & Academic Services. Concerns and conflict with your faculty advisor can be shared with the Associate Department head for Students. Beyond this, students are encouraged to communicate with Professor James Bain, Associate Department Head for Academic Affairs, or Coraluppi Head and Tanoto Professor Larry Pileggi, the Department Head. Beyond the department all graduate students can communicate their concerns to Professor Lisa Porter, Associate Dean of Graduate and Faculty Affairs.

## **Faculty Credentials**

For all faculty please visit the ECE faculty directory here:

<https://www.ece.cmu.edu/directory/faculty.html>.

Faculty based in Silicon Valley and teaching in Silicon Valley:

**Cecile Peraire, Associate Teaching Professor**

Ph.D., Computer Science, Swiss Federal Institute of Technology

**John Shen, Professor**

Ph.D., Electrical Engineering, University of Southern California

**Leonardo da Silva Souza, Assistant Teaching Professor**

Ph.D., Computer Science, Pontifícia Universidade Católica do Rio de Janeiro

**Rafal Wlodarski, Assistant Teaching Professor**

Ph.D., Lodz University of Technology

Faculty based in Pittsburgh and broadcasting courses to Silicon Valley:

**Lujo Bauer, Associate Professor**

Ph.D., Computer Science, Princeton University

**Hakan Erdogmus, Teaching Professor**

Ph.D., Telecommunications, Université du Québec

**Franz Franchetti, Professor**

Ph.D., Computational Mathematics, Vienna University of Technology

**Virgil Gligor, Professor**

Ph.D., Electrical Engineering and Computer Science, University of California at Berkeley

**Limin Jia, Associate Research Professor**

Ph.D., Computer Science, Princeton University

**Bill Nace, Teaching Professor**

Ph.D., Electrical and Computer Engineering, Carnegie Mellon University

**Aswin Sankarayanan, Associate Professor**

Ph.D., Electrical and Computer Engineering, University of Maryland

**Vyas Sekar, Associate Professor**

Ph.D., Computer Science, Carnegie Mellon University

**Osman Yagan, Associate Research Professor**

Ph.D., Electrical and Computer Engineering, University of Maryland

**Graduate Studies Committee (GSC)**

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

The GSC Chair for the 2024-2025 academic year is Professor Rohit Negi. Students should ask their academic advisor when this semester's GSC meetings take place.

**Bulletin Boards**

Students in Silicon Valley can find bulletin boards located in Buildings 23. Bulletin boards will be cleared on a regular basis.

**Shipping & Receiving**

Students on the Silicon Valley campus should work with their instructor if supplies are needed.

**Computer Clusters**

There are no computer clusters available in Silicon Valley. There are several remote access computer clusters located in the ITS Cyert Hall machine room via the Pittsburgh campus.

## Printers

Printers <https://www.cmu.edu/idplus/services/printing.html> 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.

## Keys

The Silicon Valley Facilities department will provide each Master student with relevant keys to B23 meeting rooms. To avoid any financial implications to you, keys must be returned prior to your final departure from CMU. To report a lost key or to request a replacement, please email [facilities@sv.cmu.edu](mailto:facilities@sv.cmu.edu).

## Graduate Student Lounges

There are several spaces for students in Silicon Valley to use. The main student lounges (open spaces) can be found in B23, downstairs Room 129, and CMIL. To see the full list of rooms and spaces, please see here: <https://sv.cmu.edu/information-center/campus-resources/rooms-and-spaces.html>.

## Department Office/Building Security, Repairs and Services

Any damages, repairs, or security concerns should be reported to Stacy Marshall, Facilities and Events Manager, by emailing [facilities@sv.cmu.edu](mailto:facilities@sv.cmu.edu). In an emergency, please contact NASA Police at 650-604-5555.

## General Silicon Valley Facilities Description

The Silicon Valley campus is located in the historic Shenandoah Plaza on the NASA Ames Research Park. We occupy one building – building 23. Building 23 is a 20,111 sq. ft. two-story historic building and is our main administrative and teaching building. It largely houses our academic space: 6 classrooms, 31 faculty and staff offices, 6 conference rooms, 2 kitchen/break rooms, 1 cafe lounge, and 1 multi-function lounge & event space. Located in the annex of Building 23 is the Carnegie Mellon Innovations Lab (CMIL), a 1,247 sq. ft. multi-use space.

## Local housing

The CMU campus in Silicon Valley does not offer on-campus housing or off-campus housing services. Students need to find their own housing. There are many apartment complexes and/or room rentals within a commutable distance from the campus. Housing costs vary and most students choose to have roommates. [View a range of housing prices in the Mountain View area.](#)

While our student affairs office cannot act as a real estate agency or rental broker for you, we are happy to offer our advice or suggestions on locations that may be of interest to you. For questions, please contact the Assistant Dean of Student Affairs at [student-services@sv.cmu.edu](mailto:student-services@sv.cmu.edu).

## ECE Graduate Student Organizations

- **EGO (ECE Graduate Student Organization)** organizes academic and social events throughout the academic year.

For more information on graduate student organizations and opportunities for future involvement in the ECE department, please contact **Brittany Bristoll**, Student Organizations Advisor in Silicon Valley.

## Press & Media Relations

**Kimmy Nguyen** acts as the point-of-contact between news media and the ECE Department, including faculty, students, and staff. Kimmy can also provide guidance on internal and external relations and can assist with publicizing programs, projects, events, and other ECE affiliated activity. Students should contact the department head's office with any questions related to the use of ECE brand and logos.

## University Library

Silicon Valley Campus

Library and Resources CMU-SV does not operate a library on campus, but we do have specialized library resources available for students, faculty, and staff. However, the CMU Library (<https://www.library.cmu.edu>) offers many online resources. Additional resources include:

1. Interlibrary Loan
2. e-book developments
3. University Libraries Quick Links

Through the Interlibrary loan, students can request books, articles from journals and conferences, technical reports, or other materials to be sent to you. The materials may be from Carnegie Mellon libraries in the U.S. or other institutions worldwide. Electronic delivery for many articles is available. ILLiad is the system that our students use to request these items. What ILLiad can be used for:

- To request to borrow a book, a tech report, a thesis, copy of an article, etc.
- Check status of requests
- Edit requests
- Cancel requests
- Update your contact information or delivery preferences
- Request to renew an interlibrary loan

The ILLiad link can be found at <https://illiad.library.cmu.edu/illiad/illiad.dll>.

The first time you use the link you need to provide information about yourself. You only need to do this once. When completing the form, choose these options:

- For **Mailing Address**, state: **Silicon Valley campus**
- For **Delivery Location**, state: **E&S Library**

Ebook developments can be found on our website at <http://guides.library.cmu.edu/svc>.

A digital collection of science and engineering reference books. Carnegie Mellon Users Only (including Silicon Valley Campus). Our access to their new collection on Computer Hardware Engineering is now available! You'll also find the books listed in CAMEO - our online catalog.

University Quick Links can also be found on the website at <http://guides.library.cmu.edu/svc>. Here are examples of some quick links below:

- Articles & Databases
  - Alphabetical and subject listings of our available databases.
- Cybersecurity
- e-Journals A to Z List
  - Our automated (partially) method of finding e-Journals that we have access to - even if buried in a full-text database.
- ECE Library Guide
  - Library research guide for Electrical & Computer Engineering.
- Off-Campus / Wireless Access
  - EZ Proxy single sign on added as an option!
- University Libraries Home Page

Our home page has links to the simple and advanced search functions for CAMEO - our online catalog.

For additional questions regarding library resources, please contact Matt Marsteller, Head, CMU Science Libraries at [matthewm@andrew.cmu.edu](mailto:matthewm@andrew.cmu.edu) or by phone: 412-268-7212

## PRE-MATRICULATION

### Admissions Policies

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

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

### English Language Requirements and Language Proficiency

Admission to Carnegie Mellon University graduate programs requires demonstration of completed, relevant undergraduate degree programs, as demonstrated by an original transcript from the degree-granting institution during the admission process. Domestic students who graduate from an accredited college or university in the US have demonstrated their English language facility and skill by their success and graduation from competitive undergraduate US institutions.

The DET, TOEFL or IELTS test is required of all international applicants whose native language is not English. Native language is defined as first language, or language spoken from birth. Language tests are not required if the applicant has graduated from a U.S. university or if the applicant is a CMU student or alumni. Please refer to the admissions [FAQ](#) for additional details.

Non-native English speakers may utilize Communications and Language Services Office for additional language support for nonnative English speakers: <http://sv.cmu.edu/student-services/communication-language-services.html>

### Deferral

ECE generally does not allow admission deferrals because admission decisions are based on the current applicant pool. Therefore, students are admitted 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.

Integrated Master and Bachelor students (IMBs) will be permitted to take up to a two year deferral between their bachelor's degree and their master's degree only if they have completed a minimum of 24 units towards their master's degree at the time of their undergraduate graduation.

### Final Undergraduate Transcripts

Applicants admitted to any ECE program (except for CMU alumni) 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 MS degree from being certified.



## Residency

MS programs in the Department of Electrical & Computer Engineering are in-person programs with required in-person expectation coursework. US Government rules require this of any program admitting F-1 and J-1 international students. At present there are no online or remote offerings of the MS programs.

For international students, access to individual remote courses is governed by the policies of the OIE: <https://www.cmu.edu/oie/maintaining-status/students/course-load-modality.html>

## Responsible Conduct of Research (RCR) Education

The Office of Research Integrity and Compliance website (<https://www.cmu.edu/research-compliance/index.html>) 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. Students should select Carnegie Mellon University as the participating institution when creating an account. Website: <https://www.cmu.edu/research-compliance/responsible-conduct/training.html>

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 advising team. 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 this process by reviewing degree requirements on the website and connecting with their academic advisor and faculty mentor. 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, students can use the Course Planning module 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/no-pass deadline, and the audit deadline. Academic deadline information can be found in the Academic Calendar: <https://www.cmu.edu/hub/calendar/index.html>

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

#### Degree Requirements Timeframe

The duration of all ECE MS programs for students starting the program in Spring 2020 or prior is three full-time semesters (fall-spring-fall or spring-fall-spring). Students matriculating in Fall 2020 through Spring 2023 can choose to join the Standard or Applied programs for 3 full-time semesters or the Advanced Study or Applied Advanced Study programs for 4 full-time semesters. Students matriculating Fall 2023 or later can choose to join the Standard program for 3 full-time semesters or the Advanced Study program for 4 full-time semesters. Students applying to the Artificial Intelligence in ECE or Software Engineering degree programs are expected to complete their degree requirements in 3 full-time semesters. In order to have full-time status, students must enroll in at least 36 units each semester. In order to complete program requirements, students may need to enroll in more than 36 units per semester. The maximum number of units allowed in a semester is 48 units. Students are responsible for completing their enrollment each

semester via their Student Information Online (SIO) portal. Students who are not enrolled by the add deadline will be withdrawn from the university.

Students must be physically present and attend classes 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 they are not here by the add deadline as stated in the [academic calendar](#).

International students will be given a 16 month I-20 or DS-2019. 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 in fewer than three semesters. Please see details and relevant forms on OIE's website under Maintaining Legal Status: <https://www.cmu.edu/oie/foreign-students/maintain-legal-status/index.html>

### **Summer Registration**

Students who matriculated prior to Fall 2023 in the Applied or Applied Advanced Programs are required to complete a summer internship in their first summer semester of the program. In any subsequent summers in the Applied or Applied Advanced Programs, and for any summer semester(s) in the Standard or Advanced programs, students are not required to continue their studies as the summer semester is considered a vacation semester. However, students may choose to take courses for academic credit or pursue an internship that is relevant to their MS degree if appropriate.

Eligible international students who are completing an internship in the United States must complete the paperwork for Curricular Practical Training (CPT). Academic and OIE advisors will provide students with information about CPT during the spring semester. For more information about internships and CPT, see the "Internship" section outlined in this handbook and OIE's website on Employment Options for international students: <https://www.cmu.edu/oie/foreign-students/employment.html>

### **Full- and Part-time Requirements**

The MS degree program is a full-time program in which students complete a minimum of 36 units each semester (including summer if summer is a student's final semester). Students who are interested and qualified may take an accelerated course load and complete the degree in two semesters; these students should consult with their primary academic advisor.

For international students, part-time master's enrollment requires an approved Authorization for a Reduced Course Load from the Office of International Education. International students must work with their academic advisor to submit an Authorization for a Reduced Course Load form <https://www.cmu.edu/oie/docs/reduced.pdf>. Such authorization is granted only in extenuating circumstances. Please note: due to the structure of the MS programs in the Department of Electrical & Computer Engineering, the fourth selection on this form (Student's Final Semester) is not an option. Immigration regulations do not allow CMU to issue visa documents for a part-time program.

For domestic students, part-time master's enrollment in any non-terminal semester must receive departmental approval. Departmental approval requires submission of a detailed degree plan and is only granted in extenuating circumstances.

### **Campus Location Change**

Students enrolled in the ECE Master's program at the Pittsburgh, Silicon Valley, or CMU-Africa locations may be eligible to request a change in residence to another campus after completing one semester of full-time study. Eligibility is determined by the details included in the student's admission offer and is explicitly stated in the admission offer letter. Due to limited space, location changes are not guaranteed and are subject to the discretion of the department. Students are responsible for all academic and financial impacts related to this change. Information about the location change process will be provided to eligible students.

International student internship eligibility will not be affected if students change location between Silicon Valley and Pittsburgh campuses. Location changes between U.S.-based campuses and CMU-Africa will have implications for internship eligibility for international students. Students should refer to OIE's website for employment options and consult with their OIE advisor for additional questions: <https://www.cmu.edu/oie/foreign-students/employment.html>

### **Change of Degree Program**

Sometimes students begin their ECE master's program (M.S. ECE, M.S. AIE-ECE, or M.S. SE) and realize that they would like to transfer to a different degree program than the one they were admitted to. When this occurs, students may have the option of applying to transfer to another M.S. degree program within the ECE Department. Transfers may be possible from MS AIE-ECE or MS SE degree programs to the MS ECE degree program. Transfers from the MS ECE degree program to the MS AIE-ECE or MS SE degree programs require admission. Students must meet with their academic advisor to determine if this is possible. Information about the degree change application and process will be provided to the students at that time. All degree program change applications are reviewed by the ECE Admissions Committee and are subjected to the same admission standards as initial applications to the program. Program changes are not guaranteed. In the case where a program change will also result in a campus location change, students are subject to the same policies outlined in the [Campus Location Change](#) section in this handbook.

Students are not eligible to change degree programs until after they have successfully completed 36 units at CMU, and all applications will be considered for the following semester. Students are responsible for all academic and financial impacts related to the change. Prior to changing to a new M.S. degree program, international students should consult with OIE.

Changing between the MS ECE Standard, Applied, Advanced, or Applied Advanced programs is not allowed at any time. Similarly changes between MS SE Standard and Applied programs is not allowed at any time. Students will select their program upon acceptance of their admissions offer and must remain in their declared program until degree completion.

## **Internal Transfer to another Graduate Department within CMU**

Students wishing to transfer to another graduate department within Carnegie Mellon University should consult with the admission staff of the intended transfer department for policies and procedures related to the potential transfer. Students should also alert their academic advisor regarding their intention to transfer. ECE shall share any necessary application materials (test scores, transcripts, recommendations, etc.) upon written request of the transferring student.

## **Courses Outside of Degree Requirements**

Courses that do not satisfy degree requirements include StuCo courses (98-XXX), Physical Education course (69-XXX), audited courses, and pass/no-pass courses. Similar to courses taken for degree requirements, students must register for these courses and the units will count towards their course load for the semester. For a complete list of course restrictions, see the ECE website: <https://www.ece.cmu.edu/academics/ms-ece/requirements.html>.

## **Double Counting Courses**

ECE follows the CIT Policy on double counting of courses. Students are required to notify the advising team prior to declaring a degree outside of ECE as this may have repercussions for units and coursework to date. Website: <https://www.cit.cmu.edu/education/academic-policies/graduate-policies/registration-grading-credit.html#double-counting-of-course-units-for-m.s.-and-ph.d.-degrees>

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

## **Maximum Units Allowed**

Students who are pursuing the MS degree cannot register for their final semester if they have already completed 120 units (for a 3-semester program) or 156 units (for a 4-semester program) of coursework. These units include courses taken for audit or pass/no pass, and courses from which the student withdrew. Please refer to the [CIT policy on MS degree units](#) for additional information.

If it becomes clear that a student will exceed the maximum units and not be able to maintain the required 3.0 average, the student may be dismissed from the MS ECE, MS SE or MS AIE-ECE program.

## **Maximum Units Allowed Outside CIT**

Students enrolled in a 3 semester MS ECE, MS SE, or MS AIE-ECE degree at all campuses may take no more than 12 units outside the College of Engineering towards meeting their degree requirements. Students enrolled in a 4 semester M.S. ECE degree may take no more than 36 units outside the College of Engineering towards meeting their degree requirements.

Courses will satisfy requirements based on the course number during the semester of registration. If a course number that is outside of CIT changes to be within CIT, the change will not be retroactive and the course will still qualify as being outside of CIT for all past semesters.

## Retaking Courses

If a student does not pass a course, they should take a different course to fulfill the requirement. If a student is considering retaking a course, they should contact their academic advisor. Students may retake a prerequisite course in which they did not receive the minimum grade required to continue in a course sequence.

All grades are recorded on the transcript and factored into the cumulative QPA. However, only the best 97 that fulfill degree requirements are factored into the required 3.0 program QPA.

## Auditing Courses

Auditing a course is registering for the course and being present in a classroom, without receiving academic credit or quality points. An audited course will appear on a student's transcript. Students may not regularly attend a course for which they are not registered.

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

1. Register for the course in SIO.
2. Obtain permission from the instructor and ask the instructor to sign the course audit approval form: <https://www.cmu.edu/hub/docs/course-audit.pdf>
3. Submit the form to their academic advisor for approval.
4. 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. Students can find the deadline for submitting this form on the [Academic Calendar](#). After the deadline, students are not 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. If an audited course is outside the College of Engineering (CIT), those units count towards the limited units MS ECE students may take outside CIT. Any student may audit a course. For billing, an audited course is considered the same as traditional courses for 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 wish to take a course pass/no pass are required to register for the course and submit the pass/no pass approval form ([https://www.cmu.edu/hub/docs/pass\\_fail.pdf](https://www.cmu.edu/hub/docs/pass_fail.pdf)) to their academic advisor for approval. 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 semester, cumulative or program QPA.

The units of pass/no pass courses count toward the maximum course load units, but do not count toward the degree requirements. Students can find the deadline for submitting this form in the [Academic Calendar](#). After the deadline, students are not able to request to take a course as pass/no pass.

Any student may take a course as pass/no pass. For billing, the course is considered the same as traditional courses for tuition charges. If a part time student takes a course pass/no pass, they are charged part time tuition based on the per unit tuition rate for the course.

### **COVID-19 Pass/No Pass Rule Exception**

In response to the COVID-19 pandemic, the Provost's Office and Senior Leadership created a temporary modification to the grading policy for spring 2020. These changes were for the spring 2020 semester only and were made due to the impact of COVID-19. All undergraduate and graduate students were permitted to convert any spring 2020 semester-length or mini-4 course final grade to pass/no pass during the Special Pass/No Pass Election Period. Any course grade converted to passing in spring 2020 is eligible to count towards the MS degree.

### **Petition Process**

Petitions to the Graduate Studies Committee (GSC) may include program changes or transfers, course substitutions, and any other changes outside of the policies stated in the handbook. Petitions are considered by the GSC for approval or denial. Students are advised to discuss petitions with their academic advisors.

The petition process is as follows:

1. Student completes the GSC Petition form (<https://forms.gle/yeqdeHvkWp5gLhRe8>) and notifies their academic advisor of their submission no later than 5pm EST on the Friday before a GSC meeting.
2. Academic advisor presents the petition to the GSC.
3. Students are notified of the outcome of their petition via an email from their academic advisor after the GSC has met. Generally, all GSC decisions are final.
4. Due to time constraints, some petitions may be tabled until the following GSC meeting. If this occurs, students will be notified via email.
5. Academic advisor saves a finalized version of the petition.

### **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 degree requirements of any of ECE's MS programs. As a guideline, 3-credit courses from other universities equate to 9-unit CMU courses; a 4-credit course equates to a 12-unit CMU course.

The course being transferred in must:

- Fulfill an ECE degree course requirement and be 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 (<https://www.cit.cmu.edu/education/academic-policies/graduate-policies/registration-grading-credit.html#transfer-credit-&-special-students>). The student must have earned a grade of 'B' or better for the course to be transferred. The transfer credits will appear on the student's transcript and will not be factored into the cumulative or program QPA.

Transfer credit is not granted prior to admission and must be approved by the Graduate Studies Committee and CIT Dean's Office. Courses can only be requested for transfer after the student has successfully completed 36 units of coursework at CMU. After matriculating to CMU, ECE students should consult with their academic advisor before taking a course at another university with the intention of transferring it to the ECE degree.

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.

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

1. Meet with academic advisor to discuss the course transfer.
2. Complete and collect the following mandatory documents:
  - a. Official transcript from previous institution
  - b. Detailed course description/syllabus (should include grading scale, assignments required, mandatory books, and time required in class) of the course the student wishes to transfer
  - c. Letter from the previous institution's registrar or academic advisor stating the course intended for transfer was not used towards a degree
  - d. Email endorsement from the instructor of the CMU course the student believes the desired transfer course is most equivalent to
  - e. CIT Graduate Transfer Credit Request form:  
[https://engineering.cmu.edu/\\_files/documents/graduate-students/grad\\_transfer\\_credit\\_request.pdf](https://engineering.cmu.edu/_files/documents/graduate-students/grad_transfer_credit_request.pdf)
3. Submit the completed packet to the academic advisor via the online petition form (<https://forms.gle/yeqdeHvkWp5gLhRe8>).
4. The academic advisor will share the petition with the ECE Graduate Studies Committee.
5. If the petition is approved, the academic advisor will work with the student to complete the transfer request.
6. The academic advisor will present the transfer request to the CIT Dean's office and notify the student of the result.



ECE has not entered into an articulation or transfer agreement with any specific college or university. The transfer of credits from any college or university must follow the above policy and process. Additionally, ECE does not award credit for prior experiential learning.

### **Research for Credit**

MS ECE students matriculating spring 2020 and prior can apply up to 27 units of research credit towards their MS degree requirements by registering for the MS Graduate Project course.

MS ECE students matriculating fall 2020 and later, and who select the course option, may only count 12 units of MS Graduate Project toward the core Graduate Coursework requirement. Up to an additional 15 units of MS Graduate Project can be counted toward the CIT Elective requirement, for a maximum of 27 units of research credit.

MS ECE students matriculating fall 2020 and later, and who select the project option, will be required to complete 36 units of research credit.

MS SE students can apply up to 27 units of research credit towards their degree requirements.

MS AIE-ECE students may only count 12 units of MS Graduate Project toward the core Graduate Coursework requirement via a domain specific research project approved by the department. Up to an additional 15 units can be counted toward the CIT Elective requirement, for a maximum of 27 units of research credit.

The number of research units for which a student is registered should equate to the number of hours students will complete each week. For example, 12 units of research means the student should complete 12 hours of research each week. Alternative accommodations should be worked out with the supervising faculty member.

MS Research Approval Process:

- As a student in the ECE department, you are able to view and apply for available research projects electronically, through the Student Project Tracker (SPT) system (<https://www.ece.cmu.edu/apps/spt/>). New students gain access to the system by the first day of classes in their first term of enrollment.
- Students can view the details of available research projects and submit applications.
- Student applications will be reviewed by the research instructor(s) to whose projects the student applies. Applications may also be reviewed by third parties working with or who may be interested in working with students on research projects, or with the research instructor(s) on a research project. This may include third party industry or government collaborators or sponsors of research projects. Students will be contacted by the research instructor (or someone from the research instructor's lab) if there is interest in their application.
- The research instructor will inform the student's academic advisor through the SPT system if an application is approved, and the academic advisor will register the student for the appropriate research units. Students will be registered for 18-980/18-981/18-982 based on the units reflected in the SPT system.

- If a student has already made plans to work on a research project with a faculty member, the project still needs to be created in the SPT system. Students must apply and be accepted by the faculty through this system.
- If a student is planning on conducting research with a non-ECE faculty member, the project must still be posted in the SPT system. The student and/or the research instructor must find an ECE faculty member who is willing to be a co-instructor for the project.

## Registering for Courses

### Academic Calendar

The Academic Calendar can be found at <https://www.cmu.edu/hub/calendar/> and provides information on all deadlines, including registration dates, class start dates, add/drop deadlines, exam dates, and more. ECE adheres to the official CMU academic calendar. The Heinz College and the Tepper School (<https://www.cmu.edu/tepper/academic-calendar.html>) follow their own calendars with dates that may differ from the University's calendar for the add, drop, and pass/no pass/audit deadlines. ECE students must adhere to the deadlines set by the unit offering the courses for which they are registered. Some ECE graduate classes are offered to students in CMU-Africa and the United States with differing official holidays. These courses will prominently display exceptions to the official University calendar in the course schedule.

### Stellic Degree Audit

Each student has access to the Stellic Degree Audit Application which includes degree planning tools that can show how courses, planned or scheduled, meet the degree requirements. Students can access Stellic through The Hub website at <https://www.cmu.edu/es/stellic/index.html>. Students should also meet with their academic advisor to review how their courses apply to the degree requirements.

### Course Load

Due to the rigor of the ECE programs, students are advised to take 37 units of coursework in their first semester (36 units of coursework plus 18-989, Introduction to Graduate Studies) and 36 units of coursework each semester thereafter. However, the department recognizes that our student body is diverse, and that includes how each student handles their course load. While students may register for up to a maximum of 48 units each semester, we strongly recommend students take no more than 36 units each semester. Students unsure of whether they should take 48 units should schedule an appointment with their academic advisor to discuss their reasons for overloading and prepare a plan for handling the additional load.

IMB students in graduate status may request an overload if the four courses they opt to take exceed 48 units. In order for the overload to be considered, the following conditions must be met: 1) the overload request is only for four courses whose combined unit total exceeds 48, 2) as an undergraduate student, the IMB student overloaded in at least one semester and achieved a minimum QPA of 3.5 during that semester, and 3) the IMB student earned a minimum cumulative QPA of 3.75 in their undergraduate degree.

## **Adding Courses**

Students can refer to the published [Schedule of Classes](#) for a list of classes being offered each semester. Students have the option to add courses to their schedule through SIO starting at their initial assigned registration time and ending at the add deadline. If a student wishes to be added to a course after the add deadline, the student must complete a Course Add Request Form (<https://www.cmu.edu/hub/docs/late-add.pdf>). If approved and signed by the course instructor, and providing that there is space in the desired course, the student must then 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 crosslisted with a course from another department, ECE students must register for the ECE course number.

ECE students may be able to take courses in the Tepper School of Business and can register through Tepper's system, which is separate from SIO. Tepper publishes a list of available MBA courses for non-MBA students, and in order to register, students should visit the Tepper registration site: <https://www.cmu.edu/tepper/programs/mba/curriculum/mba-course-requests/carnegie-mellon-graduate-students.html>

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. Information can be found at <https://www.cmu.edu/hub/registrar/course-changes/index.html>. There is a separate calendar for designated doctoral-level courses.

## **Course Locations**

Courses will take place in various buildings and room locations across CMU campuses as assigned by the University Registrar's Office each academic semester. Some ECE courses are broadcast between different campus locations. Students may only register for courses offered in their program location as indicated in the official Schedule of Classes.

## **Dropping Courses**

Students have the option of dropping courses from their schedule through SIO starting at their assigned registration time and ending at the drop deadline (see [Academic Calendar](#)). 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 likely allow another interested student to be enrolled and will limit disruptions to any team-based projects. If, as a result of dropping a course, a student drops below the 36 unit full time requirement, the student should discuss their overall plan with their academic advisor (see Full- and Part-time Requirements section).

## **Withdrawing from Courses**

Students should remove themselves from a course before the drop deadline each semester. If a student chooses to leave a course after the drop deadline, the student must officially withdraw from the course and should consult with their academic advisor to discuss the withdrawal. Withdrawals may take place after the drop deadline up through the course withdrawal deadline. Students must complete and submit the Course Withdrawal Request Form

(<https://www.cmu.edu/hub/docs/course-withdrawal.pdf>) 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 (<https://www.cmu.edu/policies/student-and-student-life/grading.html>). Course withdrawals result in a “W” grade on the transcript, which is not factored into the QPA. However, withdrawn courses do count towards full-time status and the maximum 120 or 156 units and, if they are outside of the College of Engineering (CIT), towards the limited units students may take outside the College of Engineering (CIT).

### **Waitlists**

It is typical for students to be on one or more waitlists at some point between the time of registration up until the add deadline. Waitlists may form for a variety of reasons, including as a common practice to ensure that students within a department have the opportunity to take the courses they need to graduate. To determine the likelihood of being registered from a waitlist for an ECE course, ECE students should email [ece-waitlists@andrew.cmu.edu](mailto:ece-waitlists@andrew.cmu.edu).

Once the semester begins, students may only attend courses for which they are registered, but may contact the instructor(s) of a course for which they are waitlisted to inquire about keeping up with class material. Being waitlisted for a course is not a guarantee that a student will eventually be enrolled. Students may only be waitlisted for a maximum of 5 courses.

If a student clears a waitlist but registering for the course would create a scheduling and/or max unit conflict, then the student will receive a timed invitation via email to resolve the conflict(s) and enroll in the course. The invitation window shrinks as the Add Deadline approaches, to a minimum of 24 hours. It is very important for students to monitor their university email at all times during the registration period. If an invitation expires, the student will be removed from the waitlist, and their prior waitlist position cannot be restored. Invitation windows cannot be extended.

As a courtesy, students should remove themselves from the waitlist and/or drop a course in which they are no longer interested 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 a waitlist will result in being dropped from the waitlist, and the previous waitlist position cannot be restored.

It is strongly recommended that students have a back-up plan in case they are not removed from a waitlist by the add deadline.

### **Course Delivery Modalities**

**Course delivery modalities** refer to how a course is offered by the instructor (i.e., in-person, remote). CMU courses may utilize a variety of course delivery modalities, which are displayed in SIO, the Schedule of Classes, and Stellic for students. Students are expected to adhere to all listed delivery modalities for each course section. Further information about the possible delivery modalities can be found on the [Enrollment Services website](#). International students should be

mindful of visa implications that may accompany registering for courses with remote delivery modalities.

### **Courses with Time Conflicts**

Students are generally not permitted to register for two courses whose scheduled meetings overlap, and will not be able to enroll in a course conflict in SIO. Registration may be possible with consent from both instructors, allowing the conflict and/or making suitable arrangements. Students must forward written permission from both instructors to their academic advisor in order to register for conflicting courses. If there is a pending invitation to enroll in a course from the waitlist, students must complete this process prior to the invitation expiration. Invitation windows cannot be extended.

### **Prerequisites**

For graduate students, a course listed in SIO may have a published prerequisite which is strongly recommended as preparation for the course in question. All prerequisites will be listed and available for view in SIO.

While SIO allows graduate students to register for courses without the published prerequisite, it is the student's responsibility to confirm that they have adequate background knowledge to be successful in the subsequent course. This background knowledge may come in the form of a course taken at CMU or the student's undergraduate institution, or other work or research experience. Students should consult with the course instructor if they have any questions or concerns about their preparation.

For some ECE courses that require 18-613/18-213, the published prerequisite will be enforced for graduate students.

### **Antirequisites**

An antirequisite is a course with content that is so similar to another existing CMU 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.

### **Corequisites**

A corequisite is a course that must be taken at the same time as, or before, another course. All corequisites are listed in SIO.

### **Crosslisted Courses**

A crosslisting involves two or more course numbers that are taught or co-taught by the same faculty, at the same time(s), and in the same room(s).

Crosslistings may occur between departments (such as an ECE course crosslisted with a course in the Computer Science department), or within the same department (such as an ECE undergraduate number crosslisted with an ECE graduate number), or both. ECE students are required to register for ECE course numbers, and ECE graduate students will have enrollment priority for ECE graduate course numbers. For ECE graduate course numbers crosslisted with ECE undergraduate course numbers, students enrolled in the graduate number will be expected to complete certain additional and/or more difficult requirements.

Selecting the appropriate section for crosslisted courses is imperative. Undergraduate course numbers (over 300-level) can only be counted as the one allowable undergraduate course toward the MS degree, and ECE graduate students will not receive enrollment priority in ECE undergraduate numbers, even if a crosslisting exists. Non-ECE course numbers do not count toward the ECE core degree requirement even if a crosslisting exists. Non-CIT course numbers count against the maximum allowable non-CIT coursework even if a crosslisting exists. The department(s) reserve the right to adjust a student's course registration as appropriate, which may include being removed from another department's course number and placed on the ECE waitlist.

## Final Exams

All CMU students must attend final exams as scheduled by the university or individual course instructors. Each semester's final examination period will be published in the Academic Calendar every semester, and students are expected to avoid making end of term arrangements until the official final exam schedule is published for all courses. The ECE administration does not have control over the university's final examination period schedule. Please refer to [Carnegie Mellon University Policies on Examinations](#) and the university's [Final Examination Conflict Guidelines](#) for additional information.

## Research Assistant & Teaching Assistant Positions

### Research Assistant for Credit

See the [Research for Credit](#) section for more information about receiving academic credit for research.

### Research Assistant for Pay

Students are permitted to pursue research opportunities for pay in any department. Students should contact faculty members individually to inquire about available opportunities and provide information on their background. The supervising faculty can provide further information about payroll procedures.

### Teaching Assistant Assignments

Teaching Assistants are a vital part of successful ECE course delivery. 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. For complete information students can visit the Teaching Opportunities website: <https://www.ece.cmu.edu/insider/teaching-opportunities.html>. Students are encouraged to communicate with the faculty of any course(s)

they are interested in supporting, who can discuss the course expectations and staffing needs. However, please note that the application and hiring process is entirely managed through ECE's online TAPS system: <https://www.ece.cmu.edu/apps/taps/>.

### **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.

### **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. For more information about requirements, see Evaluation & Certification of English Fluency for Instructors in the University Policies of this handbook.

### **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. Students can visit their website for more information: <https://www.cmu.edu/hub/registrar/student-records/verifications/>

ECE may verify some limited information in the form of a letter, which may be suitable for some purposes. Students should contact their academic advisor for more information. A common verification request, of skills students acquired through the ECE programs can only be performed by the Hub.

### **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 their academic advisor prior to taking a leave of absence in order to ensure their understanding of the leave of absence policy and its ramifications.

Leaves of absence are capped at 2 calendar years total throughout the MS program. In extreme cases, a student may request additional leave time via a petition to the GSC.

If the student does not return within two academic years, they will be administratively withdrawn from the graduate program. IMB students who have declared their graduate degree but left CMU after completing their BS degree before having graduate status must also abide by this policy. Any student intending to return to the program outside of the 2-year leave (including CMU graduates with ECE BS degrees who have not declared for the IMB prior to graduation) must reapply to the graduate program. The University Process for taking a Leave of Absence can also be found at <https://www.cmu.edu/hub/registrar/leaves-and-returns/index.html>.

Once a student decides to take a leave of absence, they should complete the Leave of Absence form (<https://www.cmu.edu/hub/docs/loa.pdf>) and bring it to their academic advisor for additional processing.

### **Returning from a Leave of Absence**

A student intending to return from leave must submit the Petition to Return from Leave of Absence form (<https://www.cmu.edu/hub/docs/return-loa.pdf>) to their academic advisor at least 30 days prior to the start of the semester in which they plan 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 mid-semester, with the exception of summers. International students who wish to return from leave in a summer term must register full time for that summer term.

Per the university policy on student leaves: "Students on leave are not permitted to live in university housing, attend classes, or maintain employment as students at Carnegie Mellon while their leave is in effect" (<https://www.cmu.edu/policies/student-and-student-life/student-leave.html>).

More information about the University's Leave of Absence and Withdrawal policies can be found here: <https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/>.

### **Degree Certification Process and Commencement**

A student must satisfy all degree requirements and achieve a minimum of 3.0 QPA in the courses applied towards the required 97 units to be eligible for degree certification. 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.

Once a student completes their degree requirements, their degree must be certified. Certification will occur regardless of whether or not a student has taken their maximum allowed units.

Carnegie Mellon Commencement only occurs at the end of spring semester. ECE holds a diploma ceremony at the end of spring semester as well. Students who are certified in the summer or fall semesters are invited to attend the next commencement ceremony. Spring graduates are invited to the spring commencement ceremony.

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. Degree titles are listed above in the section titled Graduate Degrees and Programs Offered.



## 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 was taken from another college where 'A+' is given. Grades lower than 'C', meaning 'C-' or below, are considered failure in CIT and will not count toward degree requirements. For more information, please see CIT's website: <https://engineering.cmu.edu/education/academic-policies/graduate-policies/registration-grading-credit.html>

#### Incomplete Grade

Incomplete grades may be assigned at the discretion of the course instructor, per the university grading policy: <https://www.cmu.edu/policies/student-and-student-life/grading.html>. Students should expect to establish a mutually agreed-upon plan for the completion of the remaining coursework with the course instructor. Typically, incomplete grades will only be considered if 75% or more of the coursework has been completed to date, and has been of passing quality. Students must complete the required coursework no later than the end of the following academic semester, or sooner if required by prior agreement. Students who receive an 'I' (for 'Incomplete') grade will also be given a stated default grade. The default grade will be automatically posted to the transcript if the deadline to resolve the Incomplete grade passes without the student completing the agreed-upon work.

#### Withdrawal Grade/Withdrawing from Courses

Students can withdraw from a course after the 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 (<https://www.cmu.edu/hub/docs/course-withdrawal.pdf>) must be completed and submitted to the academic advisor for approval. If approved, the academic advisor will send the form to the HUB for processing.

For the process for 'Withdrawal' from a program, students can visit: <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 97 units. Coursework or graduate project units with a grade lower than 'C' will not be considered toward graduate degree requirements. However, they will be calculated into the student's cumulative QPA.

## Quality Point Average (QPA) Calculations

Carnegie Mellon University defines a quality point as a point value times units for a given course. QPAs are calculated according to the following formula:

**Semester QPA:** quality points divided by factorable units for a given semester

**Cumulative QPA:** total quality points divided by total factorable units

See the CMU **Grading Policies** for grades not factorable into QPA. Courses taken while in undergraduate status are not factorable into the QPA for graduate students. A separate cumulative QPA is calculated for undergraduate and graduate records.

In order to graduate from the Department of Electrical & Computer Engineering, each student must have a **program QPA** of at least 3.0, defined as follows:

**Program QPA:** quality points divided by factorable units in those courses being used towards the required units (97 or 133 units depending on program)

Coursework or graduate project units with a grade lower than 'C' will not be considered toward graduate degree requirements or factored into the program QPA. However, they will be factored into the student's cumulative QPA and total units.

## Academic Probation

In the event that a student's semester QPA OR cumulative QPA falls below a 3.0, regardless of program QPA, that student will be placed on academic probation for the following term and will receive a Probation Letter from the department alerting them. While on probation, students must meet with their academic advisor and comply with their recommendations.

Based on the result of the probationary term:

- If semester QPA meets or exceeds 3.0 AND cumulative QPA meets or exceeds 3.0, the student has cleared probation.
- If semester QPA meets or exceeds 3.0 but cumulative QPA is below 3.0 for a second consecutive term, the student will be placed on Continuing Probation, regardless of program QPA, and will receive a Continuing Probation Letter.
- If semester QPA is below 3.0 for a second term, this is **grounds for dismissal**, regardless of program QPA. The student will receive a *Notice of Failure to Clear Probation, Academic Action Pending* Letter after receipt of final grades and prior to the Probation Review, the date of which will be stated in the letter. Students wishing to remain in the master's program should meet with their advisor and must prepare a petition for consideration at the Probation Review, which the advisor will present on their behalf. Following the Probation Review, the student will receive a Dismissal Letter if dismissed, or a Continuing Probation Letter if allowed to remain in the program.

Continuing Probation is rare and students may wish to consider alternatives to continuing in the degree program. For any student on **Continuing Probation**, based on the result of the continued probationary term:

- If semester QPA meets or exceeds 3.0 AND cumulative QPA meets or exceeds 3.0, the student has cleared probation.
- If semester QPA is below 3.0 OR cumulative QPA is below 3.0 for a third consecutive term, this is **grounds for dismissal**, regardless of program QPA. The student will receive a Notice of Failure to Clear Probation, Academic Action Pending Letter after receipt of final grades and prior to the Probation Review, the date of which will be stated in the letter. The student has the opportunity to meet with their advisor and, if desired, present a petition for consideration at the Probation Review. Following the Probation Review, the student will receive a Dismissal Letter if dismissed, or a Continuing Probation Letter if allowed to remain in the program.

Probation and Continuing Probation statuses are internal and will not be listed on the official transcript. If a student is on Probation or Continuing Probation in their final academic term but achieves all graduation requirements in that term, the student will have earned their degree. They will not be subject to a Probation Review and will have their degree certified.

Students may appeal any/all Academic Action decisions as outlined in the [Summary of Graduate Student Appeal and Grievance Procedures](#).

## Academic Integrity

Please review the University Policy on Academic Integrity (<https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>). The policy includes the University expectations around academic integrity and provides definitions of cheating, plagiarism, and unauthorized assistance.

A review of the University's Academic Disciplinary Actions procedures (<https://www.cmu.edu/student-affairs/theword/academic-discipline/index.html>) is also recommended. These procedures outline the process for investigating, reporting, and adjudicating violations of the University Policy on Academic Integrity. The procedures also outline the appeal process.

### Penalties for Violating Academic Integrity

Should an instructor believe that an academic integrity violation has occurred, they may consult with the Office of [Community Standards & Integrity](#), who will assist the faculty member in handling a possible academic integrity violation and, if a student is found responsible for violating academic integrity policies, determining possible sanctions. In accordance with the university's policy, a student who violates the academic integrity policy will not be permitted to drop the course in which the offense occurred in order to avoid penalty. If the student attempts to drop the course, they will be reenrolled.

After a second academic integrity violation, the ECE Department will recommend to the Academic Review Board that you will be dismissed from ECE. For more information on the policies and procedures surrounding academic integrity, please see the website for the [Office of Community Standards & Integrity](#).

### **Disciplinary Probation**

Students who have committed an academic integrity violation are placed on disciplinary probation within the department for the remainder of their academic program. While on probation, students are allowed to continue with the program but must meet with their academic advisor.

## M.S. DEGREE REQUIREMENTS

This section outlines the degree requirements for the Master's of Science in Electrical & Computer Engineering in Silicon Valley and the Master's of Science in Software Engineering in Silicon Valley. ECE course list and course descriptions are available on the ECE course website: <https://courses.ece.cmu.edu>.

### M.S. in Software Engineering – effective Fall 2020

#### MS SE - Standard

The M.S. in SE standard program is a three-semester program that is comprised of 97 units of graduate course work (600 level and above).

#### *SE Core Courses: 60 units*

The SE standard program requires 60 units (for the course option) and 48 units (for the project option) of core coursework that may not be waived or substituted. Students are required to take 18-652 Foundations of Software Engineering in their first semester. To complete the remaining required units of core coursework, please choose from the core offerings below:

- Required: 18-652 Foundations of Software Engineering (12 units)
- 18-653 Software Architecture & Design (12 units)
- 18-654 Software Verification & Testing (12 units)
- 18-657 Decision Analysis and Engineering Economics for Software Engineers (12 units)
- 18-658 Software Requirements & Interaction Design (12 units)
- 18-659 Software Engineering Methods (12 units)
- 18-668 Data Science for Software Engineering (12 units)

#### *CIT Elective Courses: 24 units*

24 units (for the course option only) must be graduate coursework (600 level or above) within CIT from the following departments

#### ECE (18)

- Carnegie Institute of Technology (CIT) (39)
- Biomedical Engineering (42)
- Chemical Engineering (06)
- Civil & Environmental Engineering (12)
- Engineering & Public Policy (19)
- Information Network Institute (14)
- Integrated Innovation Institute (49)

- Materials Science & Engineering (27)
- Mechanical Engineering (24)
- CMU-Africa (04)

EXCEPTIONS – The following CIT courses may not be counted toward CIT Elective Coursework. They may be counted toward General Technical Elective Coursework.

- Engineering & Public Policy (19) - 19-602, 19-655
- Integrated Innovation Institute (49) – 49-750, 49-751, 49-761, 49-762, 49-763, 49-764, 49-765, 49-766, 49-767, 49-770, 49-771, 49-772, 49-773, 49-774, 49-775, 49-780, 49-781, 49-782, 49-788, 49-790, 49-791, 49-792, 49-793
- Mechanical Engineering (24) – 24-792
- CMU-Africa (04) – 04-601, 04-602, 04-605, 04-900, 04-980

*General Technical Elective Courses: 12 units*

12 units of coursework (600 level or above) can be from the following programs (shown under their parent college) or individually approved courses:

Dietrich College of Humanities and Social Sciences

- Statistics (36)
- Center for the Neural Basis of Cognition (86)
- Heinz School of Information Systems (95)
- Heinz College-Wide Courses (94)

Mellon College of Science (MCS)

- Biological Sciences (03)
- Chemistry (09)
- Mathematical Sciences (21)
- Physics (33)

School of Computer Science (SCS)

- Computational Biology (02)
- Computer Science (15)
- Entertainment Technology Center (53)
- Institute for Software Research (08)
- Robotics Institute (16)
- Human-Computer Interaction Institute (05)

- Language Technologies Institute (11)
- Machine Learning (10)
- Software Engineering (17)

Tepper School of Business (TEP)

- Tepper School of Business (45)

Additional courses outside of these programs that are approved to be counted toward General Technical Elective Coursework:

- 46-926, 46-929
- 47-830, 47-834
- 51-882
- 57-947
- 80-713
- 84-688
- 90-756, 90-808
- 93-711

*Introduction to Graduate Studies (18989): 1 unit*

**Preparatory Exception:** Up to 12 units of undergraduate course work (300 level and above) may be substituted as part of the 96 core and elective units.

### **MS SE – Applied Study\***

The M.S.-AP in SE is a three-semester program that is comprised of 97 units of graduate course work (600 level and above).

*SE Core Courses: 60 units*

The SE applied program requires 60 units (for the course option) and 48 units (for the project option) of core coursework that may not be waived or substituted. Students are required to take: 18-652 Foundations of Software Engineering in their first semester. To complete the remaining required units of core coursework, please choose from the core offerings below:

- Required: 18-652 Foundations of Software Engineering (12 units)
- 18-653 Software Architecture & Design (12 units)
- 18-654 Software Verification & Testing (12 units)

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\* Available to students matriculating Fall 2020 to Spring 2023.

- 18-657 Decision Analysis and Engineering Economics for Software Engineers (12 units)
- 18-658 Software Requirements & Interaction Design (12 units)
- 18-659 Software Engineering Methods (12 units)
- 18-668 Data Science for Software Engineering (12 units)

*CIT Elective Courses: 24 units*

24 units (for the course option only) must be graduate coursework (600 level or above) within CIT from the following departments

- ECE (18)
- Carnegie Institute of Technology (CIT) (39)
- Biomedical Engineering (42)
- Chemical Engineering (06)
- Civil & Environmental Engineering (12)
- Engineering & Public Policy (19)
- Information Network Institute (14)
- Integrated Innovation Institute (49)
- Materials Science & Engineering (27)
- Mechanical Engineering (24)
- CMU-Africa (04)

EXCEPTIONS – The following CIT courses may not be counted toward CIT Elective Coursework. They may be counted toward General Technical Elective Coursework.

- Engineering & Public Policy (19) - 19-602, 19-655
- Integrated Innovation Institute (49) – 49-750, 49-751, 49-761, 49-762, 49-763, 49-764, 49-765, 49-766, 49-767, 49-770, 49-771, 49-772, 49-773, 49-774, 49-775, 49-780, 49-781, 49-782, 49-788, 49-790, 49-791, 49-792, 49-793
- Mechanical Engineering (24) – 24-792

CMU-Africa (04) – 04-601, 04-602, 04-605, 04-900, 04-980

*General Technical Elective Courses: 12 units*

12 units of coursework (600 level or above) can be from the following programs (shown under their parent college) or individually approved courses:

Dietrich College of Humanities and Social Sciences (DC)

- Statistics (36)
- Center for the Neural Basis of Cognition (86)



### Heinz College (HNZ)

- Heinz School of Information Systems (95)
- Heinz College-Wide Courses (94)

### Mellon College of Science (MCS)

- Biological Sciences (03)
- Chemistry (09)
- Mathematical Sciences (21)
- Physics (33)

### School of Computer Science (SCS)

- Computational Biology (02)
- Computer Science (15)
- Entertainment Technology Center (53)
- Institute for Software Research (08)
- Robotics Institute (16)
- Human-Computer Interaction Institute (05)
- Language Technologies Institute (11)
- Machine Learning (10)
- Software Engineering (17)

### Tepper School of Business (TEP)

- Tepper School of Business (45)

Additional courses outside of these programs that are approved to be counted toward General Technical Elective Coursework:

- 46-926, 46-929
- 47-830, 47-834
- 51-882
- 57-947
- 80-713
- 84-688
- 90-756, 90-808
- 93-711

*Introduction to Graduate Studies (18989): 1 unit*

*Summer Internship (18993)*

**Preparatory Exception:** 12 units of undergraduate course work (300 level and above) may be substituted as part of the 96 core and elective units.

## M.S. in Electrical & Computer Engineering

### Fall 2020 and later

This section outlines the degree requirements for all students who entered one of the four possible **Master of Science in Electrical & Computer Engineering** programs in Fall 2020 or later. A list of ECE courses and course descriptions are available on the ECE course website: <https://courses.ece.cmu.edu>.

#### *MS in ECE - Standard*

The M.S. in ECE standard program is a three-semester program that is comprised of 97 units of graduate course work (600 level and above). The Standard Program has two available options detailed below. The course option is available to students at both the Pittsburgh and Silicon Valley campuses. The project option is only available to students at the Pittsburgh campus.

#### ECE Core Graduate Coursework: 60 units

The MS in ECE – Standard Program (course option) requires 60 units of core coursework that may not be waived or substituted. These courses must be in the ECE Department (18) at the 600-level or above. For exceptions to the rule, please visit the MS ECE Course Requirements webpage: <https://www.ece.cmu.edu/academics/ms-ece/standard-program.html>

Only 12 units of MS Graduate Research Project (18-980) can be counted towards the core Graduate Coursework requirement.

#### CIT Elective Courses: 24 units

The MS in ECE – Standard Program (course option) requires 24 units of CIT Elective coursework that may not be waived or substituted. These courses must be in the College of Engineering (CIT) at the 600-level or above. For a list of departments within CIT and for exceptions to the rule, please visit the MS ECE Course Requirements webpage: <https://www.ece.cmu.edu/academics/ms-ece/standard-program.html>

Three units of internship (18-994 Internship for Electrical and Computer Engineering Graduate Students) or professional development (39-699 CIT Professional Development Course) coursework may also count toward CIT Electives.

Up to 15 units of MS Graduate Research (18-980/18-981) can be counted towards the CIT Elective Coursework requirement.

#### General Technical Elective Courses: 12 units

The MS in ECE – Standard Program (course option) requires 12 units of General Technical Elective coursework that may not be waived or substituted. These courses must be at the 600-level or above from the departments listed above as well as many additional departments listed on the

MS ECE Course Requirements webpage: <https://www.ece.cmu.edu/academics/ms-ece/standard-program.html>

### Introduction to Graduate Studies (18-989): 1 unit

All incoming MS ECE students must take the one-unit Introduction to Graduate Studies course (18-989) in their first semester.

**Preparatory Exception:** Up to 12 units of undergraduate course work (300-level or higher) can qualify to be substituted toward the 96 units of core or elective requirements. Qualifying coursework must be offered by the same department as either an approved core or elective course.

### *MS-AP in ECE – Applied Study\**

The M.S.-AP in ECE is a three-semester program that is comprised of 97 units of graduate course work (600 level and above). The Applied Program has two available options detailed below. The course option is available to students at both the Pittsburgh and Silicon Valley campuses. The project option is only available to students at the Pittsburgh campus.

### ECE Core Graduate Coursework: 60 units

The MS-AP in ECE (course option) requires 60 units of core coursework that may not be waived or substituted. These courses must be in the ECE Department (18) at the 600-level or above. For exceptions to the rule, please visit the MS ECE Course Requirements webpage: <https://www.ece.cmu.edu/academics/ms-ece/standard-program.html>

Only 12 units of MS Graduate Research Project (18-980) can be counted towards the core Graduate Coursework requirement.

### CIT Elective Courses: 24 units

The MS-AP in ECE (course option) requires 24 units of CIT Elective coursework that may not be waived or substituted. These courses must be in the College of Engineering (CIT) at the 600-level or above. For a list of departments within CIT and for exceptions to the rule, please visit the MS ECE Course Requirements webpage: <https://www.ece.cmu.edu/academics/ms-ece/standard-program.html>

Three units of professional development (39-699 CIT Professional Development Course) coursework may also count towards the CIT Elective.

Up to 15 units of MS Graduate Research (18-980/18-981) can be counted towards the CIT Elective Coursework requirement.

### General Technical Elective Courses: 12 units

The MS-AP in ECE (course option) requires 12 units of General Technical Elective coursework that may not be waived or substituted. These courses must be at the 600-level or above from the

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\* Available to students matriculating Fall 2020 to Spring 2023.

departments listed above as well as many additional departments listed on the MS ECE Course Requirements webpage: <https://www.ece.cmu.edu/academics/ms-ece/standard-program.html>

### Introduction to Graduate Studies (18-989): 1 unit

All incoming MS ECE students must take the one-unit Introduction to Graduate Studies course (18-989) in their first semester.

### Required Summer Internship (18-993)

ECE students who are in the Applied or Applied Advanced Study Program are required to participate in a summer internship. This internship can be either on- or off-campus and does not need to be a paid position.

ECE will enroll all students who are pursuing the required internship for a 0-unit internship course (18-993 Internship for Electrical and Computer Engineering Graduate Students), which can be taken once throughout the student's MS ECE degree program of study and is offered only during the summer. This internship will appear on a student's transcript, though no tuition will be assessed. The work for the internship must be appropriate to the goals of the academic program.

Internships should be at least 20 hours per week and last for at least 10 weeks. Deviation from this internship length is possible with faculty approval. In any semester prior to the summer internship, students are required to complete the prerequisite course 39-699 (Career & Professional Development for Engineering Masters Students). This course will assist students with applying for and securing external internships. If an external internship cannot be secured by the student, ECE faculty advisors will assist in assigning a departmental internship project to meet this requirement.

You may not end your program on the summer internship. The required 0-unit internship must be taken before you meet the program's course unit requirements. For example, if you will complete all 97 units by Spring 2021, you cannot conduct your required internship during Summer 2021.

**Preparatory Exception:** Up to 12 units of undergraduate course work (300-level or higher) can qualify to be substituted toward the 96 units of core or elective requirements. Qualifying coursework must be offered by the same department as either an approved core or elective course.

### Course Restrictions

Courses in which more than 50% of the course grade is based on a group project or more than 20% is based on attendance cannot be used towards the required units for any MS program in the department of Electrical and Computer Engineering. Mini courses worth 12 units cannot be used towards the required units. Students are responsible for checking the syllabi for classes to ensure their courses meet these requirements. For a complete list of all course restrictions, please visit the program websites:

M.S. ECE <http://www.ece.cmu.edu/programs-admissions/masters/ms-requirements.html>

M.S. SE <https://www.ece.cmu.edu/academics/ms-se/requirements.html>

For restrictions on the number of units taken outside the College of Engineering, see the section on [Maximum Units Allowed Outside CIT](#).

### Internship Course Option

ECE students who are not in the Applied or Applied Advanced Study Program may wish to participate in optional paid internships at off-campus organizations during the summer months.

ECE will enroll all students who are pursuing an optional internship for a 3-unit credit bearing internship course (18-994 Internship for Electrical and Computer Engineering Graduate Students), which can be taken once throughout the student's MS ECE degree program of study, and is offered only during the summer. This internship will appear on a student's transcript and tuition will be charged for 3 units. Please see details for CIT cost of attendance on [HUB's website](#). The work for the internship must be appropriate to the goals of the academic program and units can be applied to the less restricted elective requirement (for Spring 2020 students and prior) or the General Technical Elective requirement (for Fall 2020 students and later). The units earned are graded on the basis of a student written report. Guidelines for the report are shared with students using the 18994 Canvas page.

Eligible international students who are interested in pursuing off-campus internships must meet with departmental and OIE representatives. 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. Students are not eligible to use Curricular Practical Training authorization after they have completed all of their degree requirements.

## 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 AND FEES

As indicated in your admission offer letter, ECE does not offer financial assistance for our master’s students. Unless otherwise arranged and approved in advance, ECE students are full-time and will be charged full-time ECE tuition. 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>

Estimated charges for ECE M.S. degree:

<i>Type</i>	<i>FY24 \$</i>	<i>semesters</i> <i>Frequency</i>	<b>MS ECE/SE</b>	<b>MS ECE/SE</b>
			<b>entire program</b> <b>estimated</b> 3	<b>first semester</b>
Application Fee*	\$75	one time	\$75	\$75
Registration Fee	\$0	n/a	\$0	\$0
Enrollment Deposit	\$0	n/a	\$0	\$0
M.S. Tuition	\$28,718	per semester	\$86,154	\$28,718
Activity Fee	\$122	per semester	\$366	\$122
Technology Fee	\$235	per semester	\$705	\$235
Transportation Fee	\$131	per semester	\$393	\$131
Books and Supplies	\$1,106	per semester	\$3,318	\$1,106
Student Tuition Recovery (STRF)	\$0	n/a	\$0	\$0
			<b>\$91,011</b>	<b>\$30,387</b>

### Tuition Billing & Payments

The tuition rate for students entering ECE programs is set in the spring for the class entering in the following fall semester. Tuition for a student’s second year will likely increase in accordance with any university tuition increase for a new academic year. The tuition will increase approximately 3% each academic year.

Students will be charged tuition per semester for each semester in which they are enrolled. Summer courses, if taken, are charged additional per unit tuition. The tuition billing and payment process for all ECE students is handled centrally by The HUB. For university billing and payment policies, please refer to The HUB’s [Billing and Payments website](#).

### Part-Time Students

Part-time students will be charged tuition at the per unit rate. Arranging to pay per unit is a convenience and not intended to reduce the overall costs of the program. Students intending to be enrolled part-time should be certain their schedule reflects this by the tenth day of classes.

If a student is planning to pursue part-time coursework (< 36 units), in the event that the student registers full-time (> 35 units) at any point in that semester, they will be assessed the full-time

tuition rate and no refund will be granted. Students pursuing part-time coursework should consult with their academic advisor before changing their course schedule.

### Office of the Dean of Student Affairs 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.

### Student Financial Obligation

ECE students are subject to and must be aware of the Carnegie Mellon policy regarding student financial obligation (<https://www.cmu.edu/sfs/billing/sfo.html>).



## CAREER SERVICES

The Student Affairs team at CMU Silicon Valley 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. This team 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 here: <https://www.cmu.edu/career/handshake/>.

### Career Consultants

ECE has assigned career consultants who provide guidance through one-on-one appointments. Students in Silicon Valley can meet with Assistant Director of Career Services [Leigh Mason](#) or peer career consultants (PCCs). Appointments with Leigh or PCCs can be made through Handshake. They will also hold open student 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 the priority of academics. It is not acceptable for students to skip classes or assignments in order to attend job interviews. Students should conduct job searches in a manner that does not impede the academic progress through their graduate program.

It is also important for students to understand 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 honoring their agreements with recruiters. Students should not continue looking and interviewing for positions after they have accepted an offer.

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

### Job Classification and Salary Structure

Below are the job classification(s) for which the MS ECE and SE programs prepare graduates:

Program	CIP	SOC	
Software Engineering	14.0903	11-9041	Architectural and Engineering Managers
		15-1243	Database Architects
		15-1252	Software Developers

		15-1253	Software Quality Assurance Analysts and Testers
		25-1032	Engineering Teachers, Postsecondary
Electrical Engineering	14.1001	11-9041	Architectural and Engineering Managers
		17-2011	Aerospace Engineers
		17-2061	Computer Hardware Engineers
		17-2071	Electrical Engineers
		17-2072	Electronics Engineers, Except Computer
		25-1032	Engineering Teachers, Postsecondary

## UNIVERSITY POLICIES

### Evaluation & Certification of 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 at: <https://www.cmu.edu/policies/faculty/evaluation-certification-english-fluency-instructors.html>

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: [www.cmu.edu/student-success](http://www.cmu.edu/student-success)

### Retention of Student Records

Carnegie Mellon University has an official policy on the retention of student records. Please visit this website for the University's policy: <https://www.cmu.edu/es/docs/record-retention-policy.pdf>

### 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: <http://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 prior to filing a withdrawal form as there will be visa repercussions.

### University Grievances

Students are encouraged to discuss any concerns or grievances informally within ECE. If a student is not satisfied with the results of informal discussion or formal appeal at the department level, he or she may follow the [guidelines](#) on Graduate Student Appeal and Grievance Procedures. Students are likewise encouraged to speak directly to their graduate student's representatives and to the president of the Graduate Student Assembly (GSA). The complete reference to this policy is available at: <http://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>

## Summary of Graduate Student Appeal and Grievance Procedures

Graduate students will find the Summary of Graduate Student Appeal and Grievance Procedures on the Graduate Education Resource webpage. This document summarizes processes available to graduate students who seek review of academic and non-academic issues. Generally, graduate students are expected to seek informal resolution of all concerns within the applicable department, unit, or program before invoking formal processes. When an informal resolution cannot be reached, however, a graduate student who seeks further review of the matter is to follow the formal procedures outlined here. These appeal and grievance procedures shall apply to students in all graduate programs of the University. Students should refer to the department specific information in this handbook for department and college information about the administration and academic policies of the program.

<https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>

## Verification of Employment

Carnegie Mellon University employees or former employees are required to use Employment Verification Request Form to request employment verification. Vendors, such as mortgage companies, may continue to use standard formats with a signed authorization. Details and forms are available at <https://www.cmu.edu/hr/resources/hr-partners/hr-services/>.

## APPENDIX A

2024-2025

# Highlighted University Resources for Graduate Students and The WORD, Student Handbook

### Key Resources for Graduate Student Support

#### Office of Graduate and Postdoc Affairs

[www.cmu.edu/graduate](http://www.cmu.edu/graduate); [grad-ed@cmu.edu](mailto:grad-ed@cmu.edu)

The Office of Graduate and Postdoctoral Affairs provides university-wide support for all graduate students and academic programs, with a focus on supporting graduate student success at Carnegie Mellon. Examples of resources offered through the Office of Graduate and Postdoctoral Affairs include, but are not limited to:

- Website with university resources, contact information for CMU programs and services, calendar of events related to graduate students
- Bi-monthly newsletter to all graduate students with information on activities, resources and opportunities
- Professional Development Seminars and Workshops
- GSA/Provost Conference Funding Grants
- GSA/Provost Small Research Grants (GuSH)
- Consultations on issues related to the graduate student experience

The Office of Graduate and Postdoc Affairs also works with the colleges and departments by informing and assisting in developing policy and procedures relevant to graduate students and working with departments on issues related to graduate students. Additionally we partner with many other offices and organizations, such as the Graduate Student Assembly, to support the holistic graduate student educational experience.

#### Office of the Dean of Students

<https://www.cmu.edu/student-affairs/dean>

The Office of the Dean of Students provides central leadership of the metacurricular experience at Carnegie Mellon including the coordination of student support. Vice President of Student Affairs and Dean of Students Gina Casalegno leads the Division of Student Affairs which includes the offices and departments listed below (not an exhaustive list).

Graduate students will find the enrollment information for [Domestic Partner Registration and Childbirth/Maternity Accommodations](#) in the Office of the Dean of Students or on their [website](#). This Office also manages the [Student Emergency Support Funding](#) process. There are three forms of support funding for enrolled students: emergency student loans, maternity loans, and the Tartan Emergency Support Fund. These funds are made available through generous gifts of alumni and friends of the university as well as support from student organizations,

Undergraduate Student Senate and the Graduate Student Assembly. Students will be provided with additional information about the various types of funding during a consultation meeting with a member of the Dean of Students team. Tuition costs are not eligible for Student Emergency Support funding.

Additional resources for graduate students include **College Liaisons** and the **Student Support Resources** team. **College Liaisons** are senior members of the Division of Student Affairs who work with departments and colleges addressing student concerns across a wide range of issues. College Liaisons are identified on the student SIO page in the Important Contacts list. The Student Support Resources team offers an additional level of support for students who are navigating any of a wide range of life events. **Student Support Resources** staff members work in partnership with campus and community resources to provide coordination of care and support appropriate to each student's situation.

The Division of Student Affairs includes (not an exhaustive list):

- **Athletics, Physical Education and Recreation**
- **Career and Professional Development Center (CPDC)**
- **Center for Student Diversity and Inclusion**
- **Cohon University Center**
- **Counseling & Psychological Services (CaPS)**
- **Dining Services**
- **Office of Community Standards and Integrity (OCSI)**
- **Office of Student Leadership, Involvement, and Civic Engagement (SLICE)**
- **University Health Services (UHS)**
- **Wellness Initiatives**

### **Center for Student Diversity & Inclusion**

<https://www.cmu.edu/student-diversity/>

Diversity and inclusion have a singular place among the values of Carnegie Mellon University. The Center for Student Diversity & Inclusion actively cultivates a strong, diverse and inclusive community capable of living out these values and advancing research, creativity, learning and development that changes the world.

The Center offers resources to enhance an inclusive and transformative student experience in dimensions such as access, success, campus climate and intergroup dialogue. Additionally, the Center supports and connects historically underrepresented students and those who are first in their family to attend college in a setting where students' differences and talents are appreciated and reinforced, both at the graduate and undergraduate level. Initiatives coordinated by the Center include, but are not limited to:

- First generation/first in family to attend college programs
- LGBTQ+ Initiatives
- Race and ethnically-focused programs, including Inter-University Graduate Students of Color Series (SOC) and PhD SOC Network

- Women’s empowerment programs, including Graduate Women’s Gatherings (GWGs) ▪ Transgender and non-binary student programs

### **Assistance for Individuals with Disabilities**

<http://www.cmu.edu/disability-resources/>

The Office of Disability Resources at Carnegie Mellon University has a continued mission to provide physical, digital, and programmatic access to ensure that students with disabilities have equal access to their educational experience. We work to ensure that qualified individuals receive reasonable accommodations as guaranteed by the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973. Students who would like to receive accommodations can begin the process through [Disability Resources' secure online](#) portal or email [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) to begin the interactive accommodation Process.

Students with physical, sensory, cognitive, or emotional disabilities are encouraged to selfidentify with the Office of Disability Resources and request needed accommodations. Any questions about the process can be directed to [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu), or call (412) 268- 6121.

### **Eberly Center for Teaching Excellence & Educational Innovation**

[www.cmu.edu/teaching](http://www.cmu.edu/teaching)

We offer a wide variety of confidential, consultation services and professional development programs to support graduate students as teaching assistants or instructors of record during their time at Carnegie Mellon University and as future faculty members at other institutions. Regardless of one's current or future teaching context and duties, our goal is to disseminate evidence-based teaching strategies in ways that are accessible and actionable. Programs and services include campus-wide Graduate Student Instructor Orientation events and our Future Faculty Program, both of which are designed to help participants be effective and efficient in their teaching roles. The Eberly Center also assists departments in creating and conducting customized programs to meet the specific needs of their graduate student instructors. Specific information about Eberly Center support for graduate students is found at [www.cmu.edu/teaching/graduatestudentsupport/index.html](http://www.cmu.edu/teaching/graduatestudentsupport/index.html).

### **Graduate Student Assembly**

[www.cmu.edu/stugov/gsa/index.html](http://www.cmu.edu/stugov/gsa/index.html)

The Graduate Student Assembly (GSA) is the branch of Carnegie Mellon Student Government that represents, and advocates for the diverse interests of all graduate students at CMU. GSA is composed of representatives from the different graduate programs and departments who want to improve the graduate student experience at the different levels of the university. GSA is funded by the Student Activities Fee from all graduate students. GSA passes legislation, allocates student activities funding, advocates for legislative action locally and in Washington D.C. on behalf of graduate student issues and needs, and otherwise acts on behalf of all graduate student interests. Our recent accomplishments are a testament to GSA making a difference, and steps to

implementing the vision laid out by the strategic plan. <https://www.cmu.edu/stugov/gsa/About-the-GSA/Strategic-Plan.html>.

GSA offers an expanding suite of social programming on and off-campus to bring graduate students from different departments together and build a sense of community. GSA is the host of the Graduate Student Lounge on the 3rd floor of the Cohon University Center- a great place to study or meet up with friends. GSA also maintains a website of graduate student resources on and off-campus. Through GSA's continued funding for professional development and research conferences, the GSA/Provost Conference Funding Program and GSA/Provost GuSH Research Grants are able to run, as managed by the Graduate Education Office. As we move forward, GSA will continue to rely on your feedback to improve the graduate student experience at CMU. Feel free to contact us at [gsa@cmu.edu](mailto:gsa@cmu.edu) to get involved, stop by our office in the Cohon University Center Room 304 or become a representative for your Department.

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/professionaldevelopment/index.html>

GuSH Research Funding is a source of small research grant funds provided by the Graduate Student Assembly (GSA) and the Provost's Office and managed by the Office of Graduate and Postdoc Affairs. Students can find more information about the application process and deadlines at: <https://www.cmu.edu/graduate/professional-development/research-funding/index.html>

### **Office of International Education (OIE)**

<http://www.cmu.edu/oie/>

Carnegie Mellon hosts international graduate and undergraduate students who come from more than 90 countries. The Office of International Education (OIE) is the liaison to the University for all non-immigrant students and scholars, as well the repository for study abroad opportunities and advisement. OIE provides many services including: advising on personal, immigration, study abroad, academic, and social and acculturation issues; presenting programs of interest such as international career workshops, tax workshops, and cross-cultural and immigration workshops; international education and statistics on international students in the United States; posting pertinent information to students through email and the OIE website, and conducting orientation and pre-departure programs.

### **Veterans and Military Community**

<http://www.cmu.edu/veterans/>

Military veterans are a vital part of the Carnegie Mellon University community. Graduate students can find information on applying for veteran education benefits, campus services, veteran's groups at CMU, and non-educational resources through the Veterans and Military Community website. There are also links and connections to veteran resource in the Pittsburgh



community. The ROTC and Veteran Affairs Coordinator can be reached at [urovaedbenefits@andrew.cmu.edu](mailto:urovaedbenefits@andrew.cmu.edu) or 412-268-8747.

### **Carnegie Mellon Ethics Hotline**

<https://www.cmu.edu/hr/resources/ethics-hotline.html>

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity, violations of university policy, or violations of law.

Topic areas for reporting may include, but are not limited to:

- Academic and Student Life
- Bias Reporting
- Discriminatory Harassment / Sexual Misconduct / Title IX
- Employee Misconduct
- Employment Related
- Environmental Health and Safety / Pandemic Safety
- Financial Matters
- Health and Wellness
- Information Systems and Data Privacy
- Public Safety & Criminal Activity
- Research & Intellectual Property

Students, faculty and staff can anonymously file a report by calling 1-844-587-0793 or visiting [cmu.ethicspoint.com](http://cmu.ethicspoint.com). All submissions are reported to appropriate university personnel and handled discreetly.

**The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.**

### **Policy Against Retaliation**

It is the policy of Carnegie Mellon University to protect from retaliation any individual who makes a good faith report of a suspected violation of any applicable law or regulation, university Policy or procedure, any contractual obligation of the university, and any report made pursuant to the Carnegie Mellon University Code of Business Ethics and Conduct.

Additional details regarding the Policy Against Retaliation are available at <https://www.cmu.edu/policies/administrative-and-governance/whistleblower.html>

## **Key Offices for Academic & Research Support**

### **Computing and Information Resources**

[www.cmu.edu/computing](http://www.cmu.edu/computing)

Computing Services maintains and supports computing resources for the campus community, including the campus wired and wireless networks, printing, computer labs, file storage, email and software catalog. As members of this community, we are all responsible for the security of

these shared resources. Be sure to review the Safe Computing (<https://www.cmu.edu/computing/safe/>) section and the University Computing Policy (<https://www.cmu.edu/policies/information-technology/computing.html>)

Visit the Computing Services website (<https://www.cmu.edu/computing/>) to learn more. For assistance the Computing Services Help Center is available at 412-268-4357 (HELP) or [ithelp@cmu.edu](mailto:ithelp@cmu.edu).

### **Student Academic Success Center**

<https://www.cmu.edu/student-success/>

Student Academic Support Programs

### ***Communication and Language Support***

Communication Support: The program offers free consultations for all CMU students on their written, oral, and visual projects. Our trained communication consultants help communicators convey ideas clearly and effectively on a variety of STEM and humanities topics. Consultants support communication excellence on essays, technical reports, oral presentations, slides, data visualization, advanced English language learning, and many other project types. Clients can bring in a project at any stage including brainstorming ideas, organizing thoughts, responding to instructor feedback, or putting finishing touches on the final draft.

Support is offered in several modes:

- *One-on-one communication tutoring* (in-person or Zoom synchronous meeting) – Clients meet with a consultant to improve the logic, clarity, and flow of writing or presentation and receive expert feedback that will strengthen a project. When making an appointment, clients upload a draft, instructor prompts, and rubrics so consultants can use specific criteria to give relevant feedback. See the [appointment types](#) offered.
- *Video response* (asynchronous) – Clients upload documents in advance, then receive a 20- to 30-minute recorded video with a consultant's feedback. The feedback video will be received within 5 days after the scheduled appointment.
- *Group appointments* – Participate with your group to accomplish peer reviews or focus on collaborative presentation strategies.
- *Workshops* – Workshops are available on a variety of topics and help attendees learn research-backed communication strategies.
- *Resources* – An online collection of handouts and videos that concisely explain specific communication strategies are available.

### **Language and Cross-cultural Support:**

More than 60% of graduate students at Carnegie Mellon are international students, and others are nonnative speakers of English who have attended high school or undergraduate programs in the US. Many of these students want to hone their language and cross-cultural skills for academic and professional success. Students can make an appointment with a Language Development Specialist to get individualized coaching on language or cross-cultural issues. Students can choose from sessions on

- giving a strong presentation,
- writing academic emails,
- analyzing expectations and strategies for clear academic writing,
- talking how to talk about oneself as a professional in the U.S.,
- developing clearer pronunciation,
- using accurate grammar,
- building fluency, and more.

Students can make an appointment with a Language Development Specialist to get individualized coaching on language or cross-cultural issues.

The Student Academic Success Center is also charged with certifying the language of International Teaching Assistants (ITAs), ensuring that nonnative English speakers have the language proficiency needed to succeed as teaching assistants in the Carnegie Mellon classroom.

Students preparing to do an ITA Certification should plan to take classes offered by the language support team at the SASC from the beginning of their first semester. Start by contacting the language support team at the SASC website or attend a Language Support Orientation at the SASC or in your department.

### ***Learning Support***

**Academic Coaching:** Academic Coaching provides holistic one-on-one peer support and group workshops to help students find and implement their conditions for success. We assist students in improving time management, productive habits, organization, stress management, and study skills. Students will request support through the Academic Success Center website and attend in-person meetings or meet using video and audio conferencing technology to provide all students with support.

**Peer Tutoring:** Weekly Tutoring Appointments are offered in a one-on-one and small group format to students from any discipline who need assistance with a course that may not be supported by our other services. Weekly appointments give students the opportunity to interact regularly with the same tutor to facilitate deeper understanding of concepts. Students can register online through the Student Academic Success website.

**“Just in Time” Workshops:** The Student Academic Success team is available to partner with instructors and departments to identify skills or concepts that would benefit from supplemental offerings (workshops, boot camps) to support students’ academic success and learning. We are eager to help convene and coordinate outside of the classroom skill-building opportunities that can be open to any student interested in building skill or reinforcing course concept mastery.

### **University Libraries**

[www.library.cmu.edu](http://www.library.cmu.edu)

The University Libraries offers a wide range of information resources and services supporting graduate students in course-work, research, teaching, and publishing. The library licenses and purchases books, journals, media and other needed materials in various formats. Library liaisons,

consultants and information specialists provide in-depth and professional assistance and advice in all-things information - including locating and obtaining specific resources, providing specialized research support, advanced training in the use and management of data. Sign up for workshops and hands-on topic-specific sessions such as data visualization with Tableau, cleaning data with OpenRefine, and getting started with Zotero. Weekly drop-in hours for Digital Humanities and for Research Data Research Management are scheduled during the academic year. Start at the library home page to find the books, journals and databases you need; to identify and reach out to the library liaison in your field; to sign up for scheduled workshops; and to connect with consultants in scholarly publishing, research data management, and digital humanities.

### **Research at CMU**

[www.cmu.edu/research/index.shtml](http://www.cmu.edu/research/index.shtml)

The primary purpose of research at the university is the advancement of knowledge in all fields in which the university is active. Research is regarded as one of the university's major contributions to society and as an essential element in education, particularly at the graduate level and in faculty development. Research activities are governed by several university policies. Guidance and more general information is found by visiting the Research at Carnegie Mellon website.

### **Office of Research Integrity & Compliance**

[www.cmu.edu/research-compliance/index.html](http://www.cmu.edu/research-compliance/index.html)

The Office of Research Integrity & Compliance (ORIC) is designed to support research at Carnegie Mellon University. The staff work with researchers to ensure research is conducted with integrity and in accordance with federal and Pennsylvania regulation. ORIC assists researchers with human subject research, conflicts of interest, responsible conduct of research, export controls, and institutional animal care & use. ORIC also provides consultation, advice, and review of allegations of research misconduct.

## **Key Offices for Health, Wellness & Safety**

### ***Counseling & Psychological Services***

<https://www.cmu.edu/counseling/>

Counseling & Psychological Services (CaPS) affords the opportunity for students to talk privately about academic and personal concerns in a safe, confidential setting. An initial consultation at CaPS can help clarify the nature of the concern, provide immediate support, and explore further options if needed. These may include a referral for counseling within CaPS, to another resource at Carnegie Mellon, or to another resource within the larger Pittsburgh community. CaPS also provides workshops and group sessions on mental health related topics specifically for graduate students on campus. CaPS services are provided at no cost. Appointments can be made in person, or by telephone at 412-268-2922.

### ***Health Services***

[www.cmu.edu/HealthServices/](http://www.cmu.edu/HealthServices/)

University Health Services (UHS) is staffed by physicians, advanced practice clinicians and registered nurses who provide general medical care, allergy injections, first aid, gynecological care and contraception as well as on-site pharmaceuticals. The CMU Student Insurance Plan covers most visit fees to see the physicians and advanced practice clinicians & nurse visits. Fees for prescription medications, laboratory tests, diagnostic procedures and referral to the emergency room or specialists are the student's responsibility and students should review the UHS website and their insurance plan for detailed information about the university health insurance requirement and fees.

UHS also has a registered dietician and health promotion specialists on staff to assist students in addressing nutrition, drug and alcohol and other healthy lifestyle issues. In addition to providing direct health care, UHS administers the Student Health Insurance Program. The Student Health Insurance plan offers a high level of coverage in a wide network of health care providers and hospitals. Appointments can be made by visiting UHS's website, walk-in, or by telephone, 412-268-2157.

### **Campus Wellness**

<https://www.cmu.edu/wellness/>

At Carnegie Mellon, we believe our individual and collective well-being is rooted in healthy connections to each other and to campus resources. The university provides a wide variety of wellness, mindfulness and connectedness initiatives and resources designed to help students thrive inside and outside the classroom. The BeWell@CMU e-newsletter seeks to be a comprehensive resource for CMU regarding all wellness-inspired events, announcements and professional and personal development opportunities. Sign up for the Be Well monthly newsletter via <https://bit.ly/BeWellNewsletter> or by contacting the Program Director for Student Affairs Wellness Initiatives, at [alusk@andrew.cmu.edu](mailto:alusk@andrew.cmu.edu).

### **Religious and Spiritual Life Initiatives (RSLI)**

[www.cmu.edu/student-affairs/spirituality](http://www.cmu.edu/student-affairs/spirituality)

Carnegie Mellon is committed to the holistic growth of our students, including creating opportunities for spiritual and religious practice and exploration. We have relationships with local houses of worship from various traditions and many of these groups are members of CMU's Council of Religious Advisors. We also offer programs and initiatives that cross traditional religious boundaries in order to increase knowledge of and appreciation for the full diversity of the worldview traditions. Our RSLI staff are here to support students across the spectrum of religious and spiritual practice and would be more than happy to help you make a connection into a community of faith during your time at CMU.

### **University Police**

<http://www.cmu.edu/police/>

412-268-2323

The University Police Department is located at 4551 Filmore Street. The department's services include police patrols and call response, criminal investigations, fixed officer and foot officer patrols, event security, and crime prevention and education programming as well as bicycle and laptop registration. Visit the department's website for additional information about the staff,

emergency phone locations, crime prevention, lost and found, finger print services, and annual statistic reports. Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies and containing statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. Graduate students can obtain a copy by contacting the University Police Department at 412- 268-2323. The annual security and fire safety report is also available online at <https://www.cmu.edu/police/annualreports/>.

### **Shuttle and Escort Services**

Parking and Transportation coordinates the Shuttle Service and Escort Service provided for CMU students, faculty, and community. The [Shuttle & Escort website](#) has full information about these services, stops, routes, tracking and schedules.

### **The WORD**

<http://www.cmu.edu/student-affairs/theword//>

The WORD is Carnegie Mellon University's online student handbook and serves as the foundation for the department (and sometimes college) handbook. The WORD contains university-wide academic policy information and resources, community policies and resources, and describes the university level procedures used to review possible violations of these standards. It is designed to provide all students with the tools, guidance, and insights to help you achieve your full potential as a member of the Carnegie Mellon community. Information about the following is included in The WORD (not an exhaustive list) and graduate students are encouraged to bookmark this site and refer to it often. University policies can also be found in full text at: <http://www.cmu.edu/policies/>.

## APPENDIX B: ADDITIONAL INFORMATION FOR CALIFORNIA PROGRAMS

Carnegie Mellon University is a private, non-profit institution, approved to operate in California by the California Bureau for Private Post-Secondary Education. Approval to operate means compliance with state standards as set forth in the California Private Postsecondary Education Act of 2009.

Any questions a student may have regarding this catalog that have not been satisfactorily answered by the institution may be directed to the Bureau for Private Postsecondary Education at 1747 North Market Blvd, Suite 225, Sacramento, CA 95834, [www.bppe.ca.gov](http://www.bppe.ca.gov), toll-free telephone number (916) 574-8900.

As a prospective student, you are encouraged to review this catalog prior to signing an enrollment agreement. You are also encouraged to review the School Performance Fact Sheet, which must be provided to you prior to signing an enrollment agreement.

A student or any member of the public may file a complaint about this institution with the Bureau for Private Postsecondary Education by calling (888) 370-7589 toll-free or by completing a complaint form, which can be obtained on the bureau's internet website, at [www.bppe.ca.gov](http://www.bppe.ca.gov).

Class session will be held:

Carnegie Mellon University  
NASA Ames Research Park  
Bldg. 23  
P.O. Box 98  
Moffett Field, CA 94035-0001  
(650) 603-7032  
[www.cmu.edu/silicon-valley](http://www.cmu.edu/silicon-valley)

### STUDENT'S RIGHT TO CANCEL (WITHDRAWAL/LEAVES OF ABSENCE)

A student has the right to cancel the student's Enrollment Agreement by either taking a leave of absence from the Program (leaving Carnegie Mellon University temporarily with the firm and stated intention of returning) or by withdrawing from the Program (leaving Carnegie Mellon University with no intention of returning). If the student withdraws or take a leave of absence from Carnegie Mellon University, the student may be eligible for a tuition adjustment or a refund of certain fees (excluding any Application Fee, Registration Fee and Enrollment Deposit).

To cancel the student's Enrollment Agreement and take a leave of absence or withdraw, the student must complete Carnegie Mellon University's Leave of Absence or Withdrawal form, as applicable, and return it to Carnegie Mellon University's Registrar's Office, at 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213. The Leave of Absence and Withdrawal forms, and additional information about leaves of absence and withdrawal, can be found on Carnegie Mellon University's website at <https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/>.

If the student notifies Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is the earliest of:

- The date the student began the student's withdrawal or leave of absence process at Carnegie Mellon University;
- The date the student notified the student's home department at Carnegie Mellon University;
- The date the student notified the associate dean of the student's College at Carnegie Mellon University; or
- The date the student notified the Carnegie Mellon University Dean of Student Affairs.

If the student does not notify Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is:

- The midpoint of the relevant semester in which the student withdraws or takes a leave of absence;
- The last date the student attended an academically-related activity such as an exam, tutorial or study group, or the last day the student turned in a class assignment.

## **REFUND POLICY**

1. **Refunds in General.** Students who withdraw from the Program or take a leave of absence after having paid the current semester's tuition and fees or receiving financial aid are subject to the following refund and repayment policies. No other charges are refundable.
2. **Exit Counseling.** All borrowers of Federal student loans must complete a Federally mandated exit counseling session when graduating or dropping to less than half-time enrollment status, including by withdrawing or taking a leave of absence. Exit counseling prepares students for repayment. Students must complete an exit counseling session in its entirety, with complete and correct information; otherwise, the student's degree, diploma and official transcripts may be withheld. Information about exit counseling sessions can be found on Carnegie Mellon University's website at <https://www.cmu.edu/sfs/financial-aid/exit-counseling.html>.
3. **Withdrawals/Leaves On or Before 10th Class Day (during the Cancellation Period).** Students who withdraw or take a leave of absence on or before the 10th class day of the relevant semester will receive a refund of 100% of tuition and fees (excluding any Application Fee or Registration Fee and Enrollment Deposit).



4. Withdrawals/Leaves after 10th Class Day (after the Cancellation Period). Students who withdraw or take a leave of absence after the 10th class day of the relevant semester but before completing 60% of the semester will be assessed tuition based on the number of days completed within the semester. This includes calendar days, class and non-class days, from the first day of classes to the last day of final exams. Breaks which last five days or longer, including the preceding and subsequent weekends, are not counted. Thanksgiving and Spring Break are not counted. STRF will be adjusted accordingly with any adjustment of tuition. There is no tuition adjustment after 60% of the semester is completed. There is no refund of University fees after the 10th class day of the relevant semester.
5. Tuition Adjustment Appeals. Students may appeal to have tuition adjustments for their leave of absence or withdrawal if they feel that they have extenuating circumstances. These appeals will be reviewed in the context of Carnegie Mellon University's tuition adjustment policy, as stated above. These appeals must be made in writing to Carnegie Mellon University's Registrar using Carnegie Mellon University's Tuition Appeal Adjustment form. Information about Carnegie Mellon University's tuition adjustment policy and tuition adjustment appeals can be found on Carnegie Mellon University's website at <https://www.cmu.edu/sfs/tuition/adjustment>.
6. Repayment to Lenders/Third Parties. If any portion of refundable tuition and/or fees was paid from the proceeds of a loan or third party, the refund may be sent to the lender, third party or, if appropriate, to the Federal or state agency that guaranteed or reinsured the loan, as required by law and/or Carnegie Mellon University policy. Any amount of the refund in excess of the unpaid balance of the loan shall be first used to repay any student financial aid programs from which the student received benefits, in proportion to the amount of the benefits received, and any remaining amount shall be paid to the student.
7. Responsibility for Loan. If the student obtains a loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If the student has received Federal student financial aid funds, the student is entitled to a refund of moneys not paid from Federal student financial aid program funds. If the student is eligible for a loan guaranteed by the Federal or state government and the student defaults on the loan, both of the following may occur: 1) The Federal or state government or a loan guarantee agency may take action against the student, including applying any income tax refund to which the person is entitled to reduce the balance owed on the loan. 2) The student may not be eligible for any other Federal student financial aid at another institution or other government assistance until the loan is repaid.

Meeting the cost of a graduate education is a significant investment. Carnegie Mellon University is committed to making it financially possible for graduate students to enhance educational development and reach their career goals. There are many financial aid resources available to students pursuing graduate studies at Carnegie Mellon University. Carnegie Mellon University participates in a number of Federal and state financial aid programs. Information about these financial aid programs can be found on Carnegie Mellon University's website, at <http://www.cmu.edu/finaid/index.html>.

If you obtain a loan to pay for the M.S. in Electrical and Computer Engineering or Software Engineering degree programs on the Silicon Valley campus, you will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If you have received federal student financial aid funds, you are entitled to a refund of moneys not paid from federal student financial aid program funds.

Carnegie Mellon University does not have a pending petition in bankruptcy, is not operating as a debtor in possession, and has not filed a petition in bankruptcy within the preceding 5 years, nor has Carnegie Mellon had a petition in bankruptcy filed against it within the preceding 5 years that resulted in re-organization under Chapter 11 of the United States Bankruptcy Code.

The State of California established the Student Tuition Recovery Fund (STRF) to relieve or mitigate economic loss suffered by a student in an educational program at a qualifying institution, who is or was a California resident while enrolled, or was enrolled in a residency program, if the student enrolled in the institution, prepaid tuition, and suffered an economic loss. Unless relieved of the obligation to do so, you must pay the state-imposed assessment for the STRF, or it must be paid on your behalf, if you are a student in an educational program, who is a California resident, or are enrolled in a residency program, and prepay all or part of your tuition.

You are not eligible for protection from the STRF and you are not required to pay the STRF assessment, if you are not a California resident, or are not enrolled in a residency program.

It is important that you keep copies of your enrollment agreement, financial aid documents, receipts, or any other information that documents the amount paid to the school. Questions regarding the STRF may be directed to the Bureau for Private Postsecondary Education, 1747 North Market Blvd, Suite 225, Sacramento, CA 95834, (916) 574-8900 or (888) 370-7589.

To be eligible for STRF, you must be a California resident or are enrolled in a residency program, prepaid tuition, paid or deemed to have paid the STRF assessment, and suffered an economic loss as a result of any of the following:

1. The institution, a location of the institution, or an educational program offered by the institution was closed or discontinued, and you did not choose to participate in a teach-out plan approved by the Bureau or did not complete a chosen teach-out plan approved by the Bureau.
2. You were enrolled at an institution or a location of the institution within the 120 day period before the closure of the institution or location of the institution, or were enrolled in an educational program within the 120 day period before the program was discontinued.
3. You were enrolled at an institution or a location of the institution more than 120 days before the closure of the institution or location of the institution, in an educational program

offered by the institution as to which the Bureau determined there was a significant decline in the quality or value of the program more than 120 days before closure.

4. The institution has been ordered to pay a refund by the Bureau but has failed to do so.
5. The institution has failed to pay or reimburse loan proceeds under a federal student loan program as required by law, or has failed to pay or reimburse proceeds received by the institution in excess of tuition and other costs.
6. You have been awarded restitution, a refund, or other monetary award by an arbitrator or court, based on a violation of this chapter by an institution or representative of an institution, but have been unable to collect the award from the institution.
7. You sought legal counsel that resulted in the cancellation of one or more of your student loans and have an invoice for services rendered and evidence of the cancellation of the student loan or loans.

To qualify for STRF reimbursement, the application must be received within four (4) years from the date of the action or event that made the student eligible for recovery from STRF.

A student whose loan is revived by a loan holder or debt collector after a period of noncollection may, at any time, file a written application for recovery from STRF for the debt that would have otherwise been eligible for recovery. If it has been more than four (4) years since the action or event that made the student eligible, the student must have filed a written application for recovery within the original four (4) year period, unless the period has been extended by another act of law.

However, no claim can be paid to any student without a social security number or a taxpayer identification number.

**NOTICE CONCERNING TRANSFERABILITY OF CREDITS AND CREDENTIALS EARNED AT OUR INSTITUTION** The transferability of credits you earn at Carnegie Mellon University is at the complete discretion of an institution to which you may seek to transfer. Acceptance of the M.S. degree you earn in Electrical and Computer Engineering or Software Engineering is also at the complete discretion of the institution to which you may seek to transfer. If the credits or degree that you earn at this institution are not accepted at the institution to which you seek to transfer, you may be required to repeat some or all of your coursework at that institution. For this reason you should make certain that your attendance at this institution will meet your educational goals. This may include contacting an institution to which you may seek to transfer after attending Carnegie Mellon University to determine if your credits or degree will transfer.

Meeting the cost of a graduate education is a significant investment. Carnegie Mellon University is committed to making it financially possible for graduate students to enhance educational development and reach their career goals. There are many financial aid resources available to students pursuing graduate studies at Carnegie Mellon University. Carnegie Mellon University participates in a number of Federal and state financial aid programs. Information about these financial aid programs can be found on Carnegie Mellon University's website, at <http://www.cmu.edu/finaid/index.html>.

Carnegie Mellon University is accredited through a voluntary, peer-review process coordinated by the Middle States Commission on Higher Education (MSCHE or Middle States). MSCHE is one of six regional accrediting agencies in the United States, each accrediting institutions of higher

education within a specific geographic region. Middle States is recognized by the U.S. Department of Education. This recognition enables MSCHE's member institutions to establish eligibility to participate in federal financial aid programs (e.g., federal loans, grants, and work-study) administered by the U.S. Department of Education. Carnegie Mellon University has been accredited by Middle States since 1921.

Please visit <http://www.cmu.edu/middlestates/> to learn more about accreditation standards and processes and to view the University's reaccreditation reports.

The address and telephone number for the Middle States Commission on Higher Education is 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104, (267) 284-5000.

## APPENDIX C: LIST OF PROGRAM COURSES

### **Entrepreneurship and Innovation in Technology (18-601) – 12 Units**

Have an idea you want to bring to the world? Ever want to start a company?? Do you wonder what it takes to be an entrepreneur? Then this is the class for you. Entrepreneurship and Innovation in Technology is an introductory course in entrepreneurship for graduate students. The course targets non-business students and assumes no background in business. Students are exposed to fundamental concepts and issues around innovation and entrepreneurship. The course provides a foundation for starting a new venture and innovating new technologies and products within existing organizations. Topics covered will include: identifying a business opportunity, acquiring customers, building a team, developing a business model, understanding investment, managing risk, and achieving differentiation. Emphasis will be on team projects, including developing an investor pitch for an original idea.

### **Fundamentals of Modern CMOS Devices (18-610) – 12 Units**

This course is intended to provide a foundation in device operation for circuit designers working in today's sub-micron CMOS. This course will also provide advanced understanding of CMOS technology for those interested in integrated circuit process technology and device physics. We review semiconductor device physics, including carrier dynamics and the basic equations of semiconductor device physics. The operation of the p-n junction diode is also reviewed. The course includes a description of integrated circuit fabrication technology and how it is used to fabricate CMOS devices. With this foundation, we then discuss the MOS capacitor (including its application as a varactor). The theory of the MOS transistor will then be developed, followed by a discussion of important phenomena in sub-micron devices such as: velocity saturation; breakdown; drain-induced barrier lowering; random dopant fluctuations, etc. The student will learn the relationship between device geometry, e.g. length, and fabrication, e.g. doping, and the corresponding circuit performance. The course will primarily be lecture-based, with some selected simulation exercises. Students are expected to be acquainted with the basic concepts of electrical circuits; electromagnetic fields at the level of a sophomore level physics course, and to have adequate preparation in mathematics (basic differential equations and MATLAB or similar applications). Prior coursework in device physics is helpful but not required for graduate students. Lecture: 4 hrs

### **Neural Technology: Sensing and Stimulation (18-612) – 12 Units**

This course gives engineering insight into the operation of excitable cells, as well as circuitry for sensing and stimulation nerves. Initial background topics include diffusion, osmosis, drift, and mediated transport, culminating in the Nernst equation of cell potential. We will then explore models of the nerve, including electrical circuit models and the Hodgkin-Huxley mathematical model. Finally, we will explore aspects of inducing a nerve to fire artificially, and cover circuit topologies for sensing action potentials and for stimulating nerves. If time allows, we will discuss other aspects of medical device design. Students will complete a neural stimulator or sensor design project. Although students in 18-612 will share lectures and recitations with students in 18-412, students in 18-612 will receive distinct homework assignments, distinct design problems,

and distinct exams from the ones given to students in 18-412 and will be graded on a separate curve from students taking 18-412.

### **Foundations of Computer Systems (18-613) – 12 Units**

This course provides a programmer's view of how computer systems execute programs, store information, and communicate. It enables students to become more effective programmers, especially in dealing with issues of performance, portability and robustness. It also serves as a foundation for courses on compilers, networks, operating systems, and computer architecture, where a deeper understanding of systems-level issues is required. Topics covered include: machine-level code and its generation by optimizing compilers, performance evaluation and optimization, computer arithmetic, processor architecture, memory organization and management, networking technology and protocols, and supporting concurrent computation. This course is modeled after 15-213/18-213/15-513, and is intended for ECE MS students with expanded course contents presented at the graduate level. It prepares students for other graduate level computer systems courses as well as working in the industry. Anti-requisites: 15213, 18213, 15513

### **Microelectromechanical Systems (18-614) – 12 Units**

This course introduces fabrication and design fundamentals for Microelectromechanical Systems (MEMS): on-chip sensor and actuator systems having micron-scale dimensions. Basic principles covered include microstructure fabrication, mechanics of silicon and thin-film materials, electrostatic force, capacitive motion detection, fluidic damping, piezoelectricity, piezoresistivity, and thermal micromechanics. Applications covered include pressure sensors, micromirror displays, accelerometers, and gas microsensors. Grades are based on exams and homework assignments. 4 hrs. lec.

### **Micro and Nano Systems Fabrication (18-615) – 12 Units**

This is a new course intended to introduce students to the process flow and design methodology for integrated systems fabrication. The course will present this material through two paths. Lectures will be presented on the basic unit processes of micro and nanosystems fabrication: deposition, patterning, and etching. Lectures will draw on examples from: Semiconductor device fabrication; Microelectromechanical systems (MEMS) fabrication; Magnetic device fabrication; and Optical device fabrication. Problem sets will be given based on this lecture material to allow students to quantitatively analyze certain process steps in detail. The second path for material presentation will be through a series of labs that allow students to design, fabricate and test an integrated device. These laboratories will be scheduled at regular meeting times, and will use research facilities within the ECE department. This is a PhD level course. MS or senior students must obtain permission from the instructor to be registered.

### **Nano-Bio-Photonics (18-616) – 12 Units**

Light can penetrate biological tissues non-invasively. Most of the available bio-optic tools are bulky. With the advent of novel nanotechnologies, building on-chip integrated photonic devices for applications such as sensing, imaging, neural stimulation, and monitoring is now a possibility. These devices can be embedded in portable electronic devices such as cell phones for point of

care diagnostics. This course is designed to convey the concepts of nano-bio-photonics in a practical way to prepare students to engage in emerging photonic technologies. The course starts with a review of electrodynamics of lightwaves. The appropriate choice of wavelength and material platform is the next topic. Then optical waveguides and resonators are discussed. Resonance-based sensing is introduced followed by a discussion of the Figure of Merits (FOMs) used to design on-chip sensors. Silicon photonics is introduced as an example of a CMOS-compatible platform. On-chip spectroscopy is the next topic. The second part covers nano-plasmonics for bio-detection and therapy. The design methods are discussed, followed by an overview of nanofabrication and chemical synthesis, and then a discussion of applications. The last part of this course will be dedicated to a review of recent applications such as Optogenetic neural stimulation, Calcium imaging, Cancer Imaging and Therapy. Senior or graduate standing required. This course is cross-listed with 18416. Although students in 18-616 and 18-416 will share the same lectures and recitations, students in 18-616 will receive distinct course projects. Students in 18-416 and 18-616 will be graded on separate curves.

### **Smart Grids and Future Electric Energy Systems (18-618) – 12 Units**

The course offers an advanced presentation of modern electric power systems, starting from a brief review of their structure and their physical components, through modeling, analysis, computation, sensing and control concepts. Great care is taken to avoid presenting "practical" techniques built on dubious theoretical foundations and also to avoid building elaborate "mathematical" models whose physical validity and relevance may be questionable. Mastering both principles and relevant models is important for those who wish to seriously understand how today's electric power grids work and their challenging technical issues. This prepares students for working on applying many novel information processing concepts for designing and operating more reliable, secure, and efficient electric energy systems. Students interested in both applied physics and signals and systems should consider taking this subject. Once the fundamentals of today's power systems are understood, it becomes possible to consider the role of smart electric power grids in enabling evolution of future electric energy systems. Integration of intermittent energy resources into the existing grid by deploying distributed sensors and actuators at the key locations throughout the system (network, energy sources, consumers) and changes in today's Supervisory Control and Data Acquisition (SCADA) for better performance become well-posed problems of modeling, sensing and controlling complex dynamic systems. This opens opportunities to many innovations toward advanced sensing and actuation for enabling better physical performance. Modeling, sensing and control fundamentals for possible next generation SCADA in support of highly distributed operations and design are presented. Prior knowledge in 18-418 or 18-771 is highly recommended.

### **Digital Integrated Circuit Design (18-622) – 12 Units**

This course covers the design and implementation of digital circuits in a modern VLSI process technology. Topics will include logic gate design, functional unit design, latch/flip-flop design, system clocking, memory design, clock distribution, power supply distribution, design for test, and design for manufacturing. The lab component of the course will focus on using modern computer aided design (CAD) software to design, simulate, and lay out digital circuits. The final project for the course involves the design and implementation to the layout level of a small

microprocessor. 18-240 and 18-320 or equivalent background material with permission of the instructor. Although students in 18-422 and 18-622 will share lectures, labs, and recitations, students in 18-422 and 18-622 will receive different homework assignments, design projects, and exams, and in some cases 18-622 students will also have different or additional lab sessions.

### **Analog Integrated Circuit Design (18-623) – 12 Units**

Some form of analog circuit design is a critical step in the creation of every modern IC. First and foremost, analog circuits act as the interface between digital systems and the real world. They act to amplify and filter analog signals, and to convert signals from analog to digital and back again. In addition, high performance digital cell design (either high speed or low power) also invokes significant analog circuit design issues. The goal of this course is to teach students some of the methods used in the design and analysis of analog integrated circuits, to illustrate how one approaches design problems in general, and to expose students to a broad cross-section of important analog circuit topologies. The course will focus on learning design through carrying out design projects. Design and implementation details of wide-band amplifiers, operational amplifiers, filters and basic data converters will be covered. Example topics to be covered include transistor large- and small-signal device models, small-signal characteristics of transistor-based amplifiers, large-signal amplifier characteristics and nonidealities, operational amplifier design, basic feedback amplifier stability analysis and compensation, and comparator design. The course will focus primarily on analog CMOS, but some aspects of BJT design will be discussed. 18-290 and 18-320 or equivalent background material with permission of the instructor. Although students in 18-623 will share Lectures and Recitations with students in 18-421, students in 18-623 will receive distinct homework assignments, distinct design problems, and distinct exams from the ones given to students in 18-421 and will be graded on a separate curve from students taking 18-421.

### **ULSI Mobile Platform and Server Product Design (18-625) – 12 Units**

The objective of this class is to design an ULSI (Ultra Large Scale Integrated) mobile platform and a server product in two scenarios: System on Chip (SoC) and System in Package (SiP). State-of-the-art 2016 technology nodes (28nm, 20nm or 14nm) will be assumed for the SoC scenario and full 3-D integration with Through Silicon Vias (TSV) will be pursued for the 2020 SiP scenario. Students will be given all the necessary technology data (device performance, interconnect parasitics, wafer and TSV/package costs, and also the expected yield data). The design objective is to deliver a product competitive to the leading products available on the market or anticipated in 5 years. The complete product design will be carried out focusing on the processor cores, graphics and the embedded memories (including new generation memories in the 2020 scenarios). System performance and power will be estimated using provided simulators for specified benchmarks. The goal is to minimize the product cost by maximizing the number of good die per wafer while achieving competitive product performance and power objectives. Prerequisites: 18664 or instructor permission

### **Introduction to Information Security (18-631) – 12 Units**



Our growing reliance on information systems for daily activities, ranging from remote communications to financial exchanges, has made information security a central issue of our critical infrastructure. The course introduces the technical and policy foundations of information security. The main objective of the course is to enable students to reason about information systems from a security engineering perspective, taking into account technical, economic and policy factors. Topics covered in the course include elementary cryptography; access control; common software vulnerabilities; common network vulnerabilities; policy and export control laws, in the U.S., Japan, and elsewhere; privacy; management and assurance; economics of security; and special topics in information security. Prerequisites: The course assumes a basic working knowledge of computers, networks, C and UNIX programming, as well as an elementary mathematics background, but does not assume any prior exposure to topics in computer or communications security. Students lacking technical background (e.g., students without any prior exposure to programming) are expected to catch up through self-study.

### **Introduction to Hardware Security (18-632) – 12 Units**

This course covers basic concepts in the security of hardware systems. Topics covered include active and passive attacks, reverse engineering, counterfeiting, and design of hardware security primitives (e.g., random number generators, physical unclonable functions, crypto-processors). Lab sessions will give students hands on experience with performing attacks, developing countermeasures, and implementing secure hardware building blocks. Students are expected to have basic knowledge of digital logic and Register-Transfer Level (RTL) design, but no specific background in security/cryptography is necessary.

### **Browser Security (18-636) – 12 Units**

The Web continues to grow in popularity as platform for retail transactions, financial services, and rapidly evolving forms of communication. It is becoming an increasingly attractive target for attackers who wish to compromise users' systems or steal data from other sites. Browser vendors must stay ahead of these attacks by providing features that support secure web applications. This course will study vulnerabilities in existing web browsers and the applications they render, as well as new technologies that enable web applications that were never before possible. The material will be largely based on current research problems, and students will be expected to criticize and improve existing defenses. Topics of study include (but are not limited to) browser encryption, JavaScript security, plug-in security, sandboxing, web mashups, and authentication. The course will involve an intensive group research project focusing on protocols/algorithms, vulnerabilities, and attacks as well as several individual homework and programming tasks. Groups will perform a sequence of cumulative tasks (literature review, analysis, simulation, design, implementation) to address aspects of their chosen topic, occasionally reporting their results to the class through brief presentations, leading to a final report.

### **Wireless Security (18-637) – 12 Units**

With the surge of mobile device use, embedded system deployment, and development of always-connected devices, the underlying wireless communication and network systems are becoming more critical for everyday use. Even though security and privacy have emerged as important focus areas for modern technology, the wireless links that connect our pervasive devices are still

less understood from the perspectives of security and privacy than other system aspects. This course will focus on the challenges in providing secure communication and network services in a variety of wireless systems and current and past approaches to manage these challenges. Topic coverage will include vulnerabilities, attacks, security mechanisms, and trade-offs at various layers of the network protocol stack, from aspects of physical communication to application and service security issues; examples include jamming, MAC-layer misbehavior, selective packet dropping, decentralized trust and reputation, and cross-layer holistic attacks. Systems of interest include (but are not limited to) personal devices, connected vehicles, embedded and IoT systems, wireless infrastructure, and ad hoc networks. Class material will be largely based on recent and current research. In addition to individual homework assignments, students will participate in an intensive group project involving significant research, development, and experimentation. Graduate standing is required to register for this course.

### **Mobile and IoT Security (18-638) – 12 Units**

For many people, mobile and embedded devices have become an essential part of life and work. As such devices represent many and varied combinations of technologies, they have unique security and privacy issues that potentially impact users, developers, service providers, manufacturers, and regulators. This course will focus on various aspects of security and privacy that are faced by mobile and Internet of Things devices, including aspects of wireless communication and networking, mobile computing, data analytics, security, and privacy. The course will include studies of security and privacy aspects of networking (including telecom, enterprise, personal, etc.), applications, and data analytics as relevant to mobile and embedded/IoT devices. One of the main goals of the course is to improve knowledge and awareness of security issues faced by mobile application developers, embedded system builders, and smart system designers. Material will cover standards, best practices, and research challenges in both deployed and emerging systems. Topics of study include (but are not limited to) telecom protocols and vulnerabilities; mobile/IoT network security; security and privacy in edge computing; mobile application security; and location and activity privacy. In addition to individual homework assignments, students will participate in an intensive group project involving significant research, development, and experimentation. Graduate standing is required to register for this course.

### **Policies of the Internet (18-639) – 12 Units**

This course will address public policy issues related to the Internet. This may include policy issues such as network neutrality and the open Internet, Internet governance and the domain name system (and the role of the United Nations), copyright protection of online content, regulation of indecency and pornography, universal access to Internet and Internet as a "human right," government surveillance of the Internet, Internet privacy and security, and taxation of electronic commerce. It will also teach some fundamentals of Internet technology. Because these are inherently interdisciplinary issues, the course will include detailed discussions of technology, economics, and law, with no prerequisites in any of these areas. Senior or graduate standing required.

### **Hardware Arithmetic for Machine Learning (18-640) – 12 Units**

In this course, students explore the techniques for designing high-performance digital circuits for computation along with methods for evaluating their characteristics. We begin by reviewing number systems and digital arithmetic along with basic arithmetic circuits such as ripple-carry adders. From there, we move to more complex adders (carry-look-ahead, carry-skip, carry-bypass, etc.), multipliers, dividers, and floating-point units. For each circuit introduced, we will develop techniques and present theory for evaluating their functionality and speed. Other methods will be described for analyzing a circuit's power consumption, testability, silicon area requirements, correctness, and cost. In addition, we will utilize various CAD tools to evaluate the circuits described. Finally, advanced timing and clocking concepts will be investigated. For example, the notion of clock skew will be introduced and its impact on clock period for sequential circuits will be analyzed. We will also learn how to analyze and design asynchronous circuits, a class of sequential circuits that do not utilize a clock signal. Course projects focus on key arithmetic aspects of various machine learning algorithms including: K-nearest neighbors, neural networks, decision trees, and support vector machines.

\*Note: Although students in 18-340 and 18-640 will share lectures, labs, and recitations, students in 18-340 and 18-640 will receive different homework assignments, design projects, and exams. In some cases 18-640 students will also have different or additional lab sessions. The homework assignments, design projects, and exams that are given to the students registered for 18-640 will be more challenging than those given to the students registered for 18-340 in that they will have more complex designs, involve additional theoretical analysis, and have more stringent specifications (e.g., in area, power, performance, and robustness).

### **Design Patterns for Smartphone Development (18-641) – 12 Units**

This course provides an intensive exploration of computer programming by reviewing the basics of Object-Oriented programming and moving quickly to advanced programming using design patterns and a multi-tiered architecture. As part of the course work, students will learn smartphone development and how to apply the learned programming techniques to create extensible, reusable and quality software. It is intended for master's students who have had some prior, but perhaps limited, programming experience in Java or another object-oriented programming language; it is not intended as a first course in programming.

### **Embedded System Software Engineering (18-642) – 12 Units**

In a very real sense, embedded software is what makes our everyday world function. From self-driving cars to chemical processing plant equipment, and from medical devices to the electric grid, embedded software is everywhere. You already know how to write code for a microcontroller. Now, learn software quality, safety, and security skills that are required to make embedded systems that can handle the messiness of the real world. This course provides in-depth coverage of the topics that are essential to the success of embedded software projects based on case studies of industry project teams that have suffered or failed. Students will learn about a variety of topics including: lightweight but high quality embedded software processes, technical best practices for embedded software, effective testing and validation, causes of software system failures, software for safety-critical systems, and embedded-specific aspects of software security. The material will generally be broken up into a set of four related topics each

week, with one assignment per topic weekly, involving a combination of programming assignments, tool use experiences, and research questions to get hands-on experience at dealing with the types of problems that are encountered in industry embedded projects. We assume you already know how to code in C and understand the basics of microcontrollers. This course is about getting you ready to build industry-strength embedded projects. Undergraduate students are required to take 18349 prior to enrolling in this course. Graduate students are strongly encouraged to take 18-600/15-213/15-513/18-213 before or concurrently with this course.

### **Reconfigurable Logic: Technology, Architecture and Applications (18-643) – 12 Units**

Three decades since its original inception as a lower-cost compromise to ASIC, modern Field Programmable Gate Arrays (FPGAs) are versatile and powerful systems-on-a-chip for many applications that need both hardware level efficiency and the flexibility of reprogrammability. More recently, FPGAs have also emerged as a formidable computing substrate with applications ranging from data centers and mobile devices. This course offers a comprehensive coverage of modern FPGAs in terms of technology, architecture and applications. The coverage will also extend into on-going research investigations of future directions. Students will take part in a substantial design projects applying the latest FPGA platforms to compute acceleration. Register-Transfer Level (RTL) hardware design experience is required.

### **Special Topics in Computer Systems (18-644) – 12 Units**

This course covers applications of mobile hardware systems and the hardware associated with these systems. The course enables students 1) to analyze the implications of mobile hardware capabilities and restrictions in order to plan and develop mobile applications, 2) to propose and justify new ideas in the mobile space, and 3) to expose students to a range of mobile systems. Students will be able to devise and interface simple hardware additions to enable new applications. The course covers the elements of embedded systems development, such as hardware fundamentals, system development, as well mobile topics such as power management, machine-to-machine communication, and applications. Student teams will undertake small HW/SW interfacing projects on Arduino to sharpen their experience, and shape and build a novel application with the faculty. Unlike a conventional hardware course, the course would instead focus on the system and software implications, rather than the hardware components (i.e. CPU and radio). Prerequisites: Some understanding of basic electrical terminology; Java programming and C programming desired

### **How to Write Fast Code (18-645) – 12 Units**

The fast evolution and increasing complexity of computing platforms pose a major challenge for developers of high performance software for engineering, science, and consumer applications: it becomes increasingly harder to harness the available computing power. Straightforward implementations may lose as much as one or two orders of magnitude in performance. On the other hand, creating optimal implementations requires the developer to have an understanding of algorithms, capabilities and limitations of compilers, and the target platform's architecture and microarchitecture. This interdisciplinary course introduces the student to the foundations and state-of-the-art techniques in high performance software development using important functionality such as linear algebra kernels, transforms, filters, and others as examples. The

course will explain how to optimize for the memory hierarchy, take advantage of special instruction sets, and how to write parallel code for multicore, manycore, and cluster platforms, based on state-of-the-art research. Further, a general strategy for performance analysis and optimization is introduced that the students will apply in group projects that accompany the course. Finally, the course will introduce the students to the recent field of automatic performance tuning. Prerequisite: Senior ECE or CS undergraduate student or higher, solid C programming skills.

### **Low-Power System-on-Chip Architecture (18-646) – 12 Units**

This course provides the architectural foundations for low-power systems out of which sensors, low power embedded systems, internet of things devices and the like are created. It includes microarchitecture, energy-aware programming, energy harvesting, energy management, and real-time measurement and abstraction of energy usage at runtime. As a part of the course, we will naturally build embedded systems at a level where energy usage can be measured and controlled.

### **Embedded Real-Time Systems (18-648) – 12 Units**

Real-time embedded systems pervade many aspects of modern life ranging from household appliances, transportation and motion control systems, medical systems and devices, robotics, multimedia and mobile communications, video-games, energy generation/distribution/management, to aerospace and defense systems. This course has three complementary goals. One, it will cover the core concepts and principles underlying these systems, including resource management, scheduling, dependability and safety. Implications to multi-core platforms, SoCs, networks and communication buses will also be discussed. Mathematical models and analysis techniques will be presented. Two, the course will offer hands-on experience with implementing real-time embedded systems on realistic platforms. This will be facilitated by detailed discussions of hardware-software interfaces, concurrency and communications. Finally, application-level concepts such as signal processing, image processing, computer vision, sensor fusion and feedback control will complete an overview of the breadth and depth of real-time embedded systems. Knowledge of the C programming language, basic computer architecture and an assembly language will be assumed.

### **Distributed Embedded Systems (18-649) – 12 Units**

Embedded computers seem to be everywhere, and are increasingly used in applications as diverse as transportation, medical equipment, industrial controls, and consumer products. This course covers how to design and analyze distributed embedded systems, which typically consist of multiple processors on a local area network performing real time control tasks. The topics covered will include issues such as communication protocols, synchronization, real-time operation, fault tolerance, distributed I/O, design validation, and industrial implementation concerns. The emphasis will be on areas that are specific to embedded distributed systems as opposed to general-purpose networked workstation applications. This course assumes that students already know fundamental topics such as interrupts, basic I/O, and uniprocessor scheduling that are commonly taught in introduction-level embedded system courses such as 18-348 and 18-349. Any graduate student who has not taken one of the pre-requisite sites is responsible

for understanding relevant material necessary for this course. Additionally, all students are responsible for knowing or learning on their own intermediate-level programming in Java. Prerequisites: 18348 or 18349 and senior or graduate standing.

### **Policies of Wireless Systems (18-650) – 12 Units**

This course will address public policy issues related to wireless systems. It investigates policies related to a wide variety of emerging wireless systems and technologies, including current and next-generation cellular systems, wifi and white space devices, emerging methods of accessing spectrum, communications systems for emergency responders (firefighters, police, emergency medical services), current and next-generation television, and satellite communications. This can include the government role in facilitating the creation of infrastructure, in advancing competition among broadcasters and communications service providers, in using scarce spectrum efficiently, in promoting public safety and homeland security, and in protecting privacy and security. Because these are inherently interdisciplinary issues, the course will include detailed discussions of technology, economics, and law, with no prerequisites in any of these areas. This course is cross-listed as 18-650, 19-403, 19-713, and 95-824. Senior or graduate standing required.

### **Networked Cyber-Physical Systems (18-651) – 12 Units**

Cyber-physical systems (CPS) represent a new class of systems that bring together sensing, computation, communication, control and actuation to enable continuous interactions with physical processes. This integration of networked devices, people, and physical systems provides huge opportunities and countless applications in biology and healthcare, automotive and transportation, power grids and smart buildings, social and financial markets, etc. Hence, CPS need to provide real-time efficiency, adaptability, optimality, security and robustness to natural disasters or targeted attacks. While the focus on embedded systems relies on building computational models for specific applications, CPS need a multidisciplinary approach and a more general computational paradigm such that more-direct interactions between the system and physical world become possible. This course is primarily an in-depth introduction to networked CPS with an emphasis on methods for modeling, design, and optimization. Focus is on the dominant design paradigms like low-power and communication-centric design. Topics to be covered include: physical processes, models of concurrency, sensing and workload modeling, human behavior modeling, data-driven modeling, networking at micro- and macro-scale, system-wide resources management, programming, validation and integration. From a practical standpoint, students will directly experiment with hardware prototypes and software tools to explore concrete CPS examples. By structure and contents, this class is primarily targeted to ECE students; it can also provide a valuable basis for interdisciplinary research to students in CS and related disciplines.

### **Foundations of Software Engineering (18-652) – 12 Units**

In this course, you will learn about software engineering paradigms that have shaped the software industry over the past few decades. You will be exposed to fundamental disciplines of software engineering as well as engineering practices that crosscut system, project, and user perspectives. You will learn to iteratively define requirements, and architect, design, implement,

integrate, test, and deploy a solution. You will work on self-organizing teams and manage the work collaboratively. You will also learn to solve a real problem subject to multiple constraints while keeping the stakeholders involved throughout the lifecycle and balancing the underlying engineering tradeoffs. The topics are applied in the context of a semester-long group project. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the "Software Engineering and Design" course area requirement. Prerequisites: Basic software development experience with proficiency in at least one modern programming language and modern programming concepts. Prior to admission, students must successfully complete a programming assignment to demonstrate familiarity with required software technologies. Students who have successfully completed 18-652, Foundations in Software Engineering, are not eligible to take this course.

### **Software Architecture and Design (18-653) – 12 Units**

Software Architecture and Design is a one-semester course, aiming to train our graduate students from software engineers toward becoming a Software Architect, who is the Technical Lead of a software project team. The primary objective of the course is to help students develop skills in designing, developing, and justifying reasonable software architecture for enterprise-scale software-intensive systems, considering both functional and non-functional requirements as well as contextual system environments. Core topics include: overview of software architecture, micro architectural patterns (so-called design patterns) and macro architectural patterns (i.e., modern patterns), service oriented architecture, architectural modeling, viewpoints and perspectives, architectural analysis techniques, architectural tactics (QoS), agile architecture, and some advanced topics. Literature survey and study of state-of-the-art technologies, as well as both individual and group project work, are essential ingredients of this class. Research and practical projects build upon one another. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the Software Engineering and Design requirement. Anti-requisites: 17-655 from CS Dept. Pre-requisites: 18-652

### **Software Verification and Testing (18-654) – 12 Units**

Verification and testing (V&T) support software engineers and development teams in their endeavor to build dependable systems. These interrelated activities form the backbone of a high-quality software solution that performs its function as intended. V&T is no longer considered an exclusively backend phase undertaken by a separate quality assurance unit, vulnerable to availability of discretionary resources near project end. Rather, V&T is a cross-functional discipline applied throughout the software lifecycle from beginning to end. As such V&T is an integral and essential part of any sensible software development process. This course introduces the students to concepts, principles, theory, types, tools, and techniques of V&T with exposure to both modern, widely-applicable approaches and traditional, formal techniques. Students will acquire sufficient depth and breadth in V&T through a balanced coverage of topics. The course syllabus spans fundamentals such as V&T principles, systematic testing, input space analysis, and test coverage; practical strategies such as test-driven development, unit testing, and test design; and formal approaches such as abstraction, model checking, static analysis, and symbolic execution. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the Analysis area core course requirement. Please

note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the Analysis area core course requirement.

### **Decision Analysis and Engineering Economics for Software Engineers (18-657) – 12 Units**

Engineering software systems entails continuously making resource and technical decisions at multiple levels subject to different sources of uncertainty, cost-benefit tradeoffs, historical data, and flexibility demands. This course will develop quantitative and modeling skills for economics-based and decision-theoretic reasoning in software engineering through a repertoire of techniques from several fields. Special consideration will be given to reasoning under uncertainty and empirical approaches to tackle a variety of software engineering decision-making problems, including technology, architecture, design, product, and process decisions. The analysis techniques covered will be illustrated through domain-specific examples. Analysis techniques that will be covered include Monte Carlo Simulation, Net Present Value, Expected Value of Information, Decision Tree Analysis, Real Options Theory, Utility Theory, and Analytic Hierarchy Process. Basic data analysis concepts, including descriptives, linear regression, correlation, and hypothesis testing will be explained and used. Examples and fully-developed case studies will illustrate how these techniques can be combined to best leverage their strengths. The course has a practical focus, but includes coverage of the necessary background theories. Orientation is distinctly quantitative. Knowledge of basic probability is required. Pre-requisites: 18-652 (can be taken concurrently)

### **Software Requirements and Interaction Design (18-658) – 12 Units**

Good software systems should be engineered with user experience in mind. How can we design software systems that are at once useful, usable, and enjoyable to use?

This course addresses these challenges by integrating two disciplines: requirements engineering and interaction design. Students learn to combine user research, design-based ideation and validation, and requirements definition, within an agile software development process.

Students apply this knowledge during a semester-long project. Their goal is to envision and implement the first version of an innovative software system that could make a unique contribution to society. The system should address a real problem, satisfy real stakeholders' needs, and provide a superior user experience. Students collaborate closely with their stakeholders throughout the project for needs elicitation, design concepts validation, and usability testing.

This course is intended for ECE master students with a concentration in Software Engineering. It is a core course of the MS-SE program satisfying the "Software Engineering and Design" course area requirement.

### **Software Engineering Methods (18-659) – 12 Units**

There has been a rapid evolution of software engineering development methods over the past decades. From Waterfall to Iterative and Incremental, to Agile and Lean, we have witnessed waves of new methods, each adding significant value to the field. However, the plethora of available methods poses a challenge for software practitioners: Which method should be adopted on a specific software project? Software Engineering Methods addresses this challenge by introducing students to emerging approaches for developing software-intensive systems.



Given the vast spectrum of software development endeavors, these approaches aim at defining custom hybrid methods by focusing on software development principles and practices together with their applicability to specific project contexts. Students learn to analyze the context of a software project and recommend a custom hybrid development method that satisfies the project's specific needs. Students apply this knowledge in the context of a semester-long project where the entire class works together as a team of teams. They define the optimal software development method for their project aimed at evolving an existing software system. They build new system increments by adopting their own method. They monitor their progress and reflect on the effectiveness of their approach and the need for continuous improvement. This course is intended for ECE master students with a concentration in Software Engineering and will satisfy the "Systems" course area requirement. Prerequisites: 18652 or instructor permission

### **Optimization (18-660) – 12 Units**

Many design problems in engineering (e.g., machine learning, finance, circuit design, etc.) involve minimizing (or maximizing) a cost (or reward) function. However, solving these problems analytically is often challenging. Optimization is the study of algorithms and theory for numerically solving such problems, and it underpins many of the technologies we use today. This course is an introduction to optimization. Students will: (1) learn about common classes of optimization problems, (2) study (and implement) algorithms for solving them, and (3) gain hands-on experience with standard optimization tools. We will focus on convex optimization problems, but will also discuss the growing role of non-convex optimization, as well as some more general numerical methods. The course will emphasize connections to real-world applications including machine learning, networking, and finance. The course will involve lectures, homework, exams, and a project.

This course is crosslisted with 18460. Although students in 18460 will share lectures with students in 18660, students in 18460 will receive distinct homework assignments, distinct design problems, and distinct exams from the ones given to students in 18660. Specifically, the homework assignments, design problems and exams that are given to the 18660 students will be more challenging than those given to the 18460 students.

### **Introduction to Machine Learning for Engineers (18-661) – 12 Units**

This course provides an introduction to machine learning with a special focus on engineering applications. The course starts with a mathematical background required for machine learning and covers approaches for supervised learning (linear models, kernel methods, decision trees, neural networks) and unsupervised learning (clustering, dimensionality reduction), as well as theoretical foundations of machine learning (learning theory, optimization). Evaluation will consist of mathematical problem sets and programming projects targeting real-world engineering applications.

### **Hardware Architectures for Machine Learning (18-663) – 12 Units**

Machine learning is poised to change the landscape of computing in more ways than its broad societal applications. Indeed, hardware architectures that can efficiently run machine learning face increasing challenges due to power consumption or run time constraints that technology,

platforms, or users impose. This course provides an overview of current advances in hardware architectures that can enable fast and energy efficient machine learning applications from the edge to the cloud. Topics include hardware accelerators, hardware-software co-design, and general or application specific system design and resource management for machine learning applications.

### **ULSI Technology Status and Roadmap for System on Chips and System in Package (18-664) – 12 Units**

This course provides the necessary background for the state-of-the art technologies utilized by the leading edge products covering full spectrum of market drivers from mobile platforms, microprocessors, game chips to the highest performance systems for enterprise solutions computing. We will present all key components of such systems, i.e., logic, analog/RF and embedded memories. Then we present the technology roadmap for the upcoming generations in terms of device architecture options for logic devices (FinFET, Nanowire and Tunnel FET) and memories (Phase Change Memory , Resistive RAM and Magnetic RAM/Spin-Transfer Torque RAM) from the device level all the way to the system level specifications. The last part of the class will be devoted to the system integration issues, namely 3-dimensional integration approaches. This course is designed for MS and PhD students from diverse areas: System/Hardware Design, Circuits and Devices/Nanofabrication and is aimed at bridging the gap among these areas.

### **Analytical Performance Modeling & Design of Computer Systems (18-687) – 12 Units**

In designing computer systems one is usually constrained by certain performance requirements. For example, certain response times or throughput might be required of the system. On the other hand, one often has many choices: One fast disk, or two slow ones? What speed CPU will suffice? Should we invest our money in more buffer space, or a faster processor? Which migration policy will work best? Which task assignment policy will work best? How can we redesign the scheduling policy to improve the system performance? Often answers to these questions are counter-intuitive. Ideally, one would like to have answers to these questions before investing the time and money to build a system. This class will introduce students to analytic stochastic modeling with the aim of answering questions such as those above. Topics covered include Operational Laws, Markov Chain Theory, Queuing Theory, Modeling Empirical Loads, Simulations, and Management of Server Farms.

### **Introduction to Neuroscience for Engineers (18-690) – 12 Units**

The first half of the course will introduce engineers to the neurosciences from the cellular level to the structure and function of the central nervous system (CNS) vis-à-vis the peripheral nervous system (PNS) and include a study of basic neurophysiology; the second half of the course will review neuroengineering methods and technologies that enable study of and therapeutic solutions for diseases or damage to the CNS. A goal of this course is to provide a taxonomy of neuroengineering technologies for research or clinical application in the neurosciences. This course is cross listed with 42-630

### **Statistical Discovery and Learning (18-697) – 12 Units**

This course is designed to give students a thorough grounding in the methods, theory, mathematics and algorithms needed to do research and applications in machine learning. The topics of the course draw from machine learning, classical statistics, data mining, Bayesian statistics and information theory and other areas. This course is project-oriented and is intended to give students abundant hands-on experience with different machine learning algorithms. Students who have already taken CS 10-701/15-781 Machine Learning should not take this course.

### **Neural Signal Processing (18-698) – 12 Units**

The brain is among the most complex systems ever studied. Underlying the brain's ability to process sensory information and drive motor actions is a network of roughly 10<sup>11</sup> neurons, each making 10<sup>3</sup> connections with other neurons. Modern statistical and machine learning tools are needed to interpret the plethora of neural data being collected, both for (1) furthering our understanding of how the brain works, and (2) designing biomedical devices that interface with the brain. This course will cover a range of statistical methods and their application to neural data analysis. The statistical topics include latent variable models, dynamical systems, point processes, dimensionality reduction, Bayesian inference, and spectral analysis. The neuroscience applications include neural decoding, firing rate estimation, neural system characterization, sensorimotor control, spike sorting, and field potential analysis. Prerequisites: 18-290; 36-217, or equivalent introductory probability theory and random variables course; an introductory linear algebra course; senior or graduate standing. No prior knowledge of neuroscience is needed

### **Technical Writing for Engineers: Linguistic Foundations (18-701) – 6 Units**

Mini 1 (Linguistic Foundations) is designed for engineering students who are preparing for taking Qualifying exams. We will review the structure of Quals that have succeeded and Quals that have been less successful. Students will learn the linguistic foundations of successful overview papers (like those required in Qualifying exams). They will learn the linguistic basis of appropriate citation and the competent elaboration of the work of others. They will learn effective linguistic practices of transitioning from the work of others to their own work and elaborating their own work. They will learn principles of concision, character/action, topical coherence, cohesion, and emphasis, principles that work together to provide the written portion of a Qualifying exam with an easy flow and readability. They will learn how this system of principles can help them detect gaps in knowledge they will need to fill in by the time of the oral examination, if not in the written portion of the Qual itself. To the greatest extent possible, students will learn to apply these linguistic principles on the written portion of the Quals they are preparing that semester or have prepared in previous semesters. Prerequisites: ECE PhD standing is required.

### **Technical Writing for Engineers: Genre Foundations (18-702) – 6 Units**

Mini 2 (Genre Foundations) is designed for engineering students ready to focus on archival genres that report new knowledge, genres including but not limited to conference papers and journal publications. Students will learn principles of academic novelty and its history in the Royal Society. We will use customized software that give students a "zoomed-in" look at the impressive variety through which introductions establish significance and how they open a "gap" that the author's research was designed to fill. We will overview the important genre features and

functions of the various sections of the archival paper. Students are expected to bring to the course archival documents they are currently preparing to submit. Students will use the mini to execute a systematic revision of their document based on the genre functions and features discussed. Prerequisites: ECE PhD standing is required.

### **Managing and Leading Research and Development (18-703) – 12 Units**

This course will provide an insider's look at issues in industrial research and development laboratories that future industrial R&D personnel are likely to face.

The instructor, Prof. Mark Kryder spent nine years as Chief Technical Officer and Senior Vice President, Research for Seagate Technology, the largest disk drive manufacturer in the world. In the course, he will try to give students an improved understanding of how research and development are done in a major high-tech firm today.

The course is built around the instructor's personal experiences, but also draws heavily from business management literature and business case studies. It is expected that the course will make the transition from the university to industry easier and faster for students who have taken it and enable them to become more effective in an industrial setting in a shorter period of time. Examples of issues to be discussed will be the impact of various organizational structures upon R&D; What characteristics are desired in a research staff member vs. a staff development engineer?, What is the importance of diversity in a R&D setting? What are the relative importances of technology, marketing expertise and corporate business models in determining success of a product?; What is meant by "corporate culture" and how does it get defined?; How important are collaboration and teamwork in R&D and are they different?; What is Six Sigma and how important is it in today's business world?; How do you measure performance in R & D?, how do you effectively transfer technology from research to development?; how can you effectively leverage university research and industrial consortia?: How important is intellectual property in various industries? How important is corporate size?: What is the role of technology vision?; What are the effects of globalization on R&D?; What is a technology steering council and how can it be used to facilitate technology transfer and development?

### **Advanced Cloud Computing (18-709) – 12 Units**

Computing in the cloud has emerged as a leading paradigm for cost-effective, scalable, well-managed computing. Users pay for services provided in a broadly shared, power-efficient datacenter, enabling dynamic computing needs to be met without paying for more than needed. Actual machines may be virtualized into machine-like services, abstract programming platforms, or application-specific services, with the cloud infrastructure managing sharing, scheduling, reliability, availability, elasticity, privacy, provisioning and geo-replication.

This course will survey the aspects of cloud computing through about 30 papers and articles, executing cloud computing tasks on a state-of-the-art cloud computing service, and implementing a change or feature in a state-of-the-art cloud computing framework. There will be no final exam, but there will be one or two in-class exams. Grades will be about 50% project work and about 50% examination results.

### **Elements of Photonics for Communication Systems (18-712) – 12 Units**

The aim of this course is to provide students with a basic understanding of the elements of photonics, including the necessary primary devices that form the building blocks of modern optical communication systems. The photon is the fundamental unit particle of light, with frequencies in the range of several hundred Terahertz ( $\sim 100 \times 10^{12}$  Hz). It is a fact of the fundamental theorem of communication that information capacity increases directly with frequency. It is no wonder then that photonic communication systems have become the backbone of modern, ultra-fast and high capacity communication networks. The use of light in communication systems involves the generation, transmission, and detection of photons, along with the encoding (modulation) of signals of interest onto the light carrier wave, and the subsequent decoding (de-modulation) at the destination.

This course begins with an introduction to basic electromagnetic theory (in the frequency range that corresponds to light). The introduction includes Maxwell's equations in both free space and dielectric media. The scalar wave equation derived from the vector Maxwell equations is solved in free space as well as in dielectric media, taking into account the boundary conditions that affect the transmission and reflection of light at the dielectric interfaces. This background is then used in the discussion of the dielectric slab and the related fiber-optic waveguide that is used in the transmission of optical signals in short- and long-haul communication systems.

The course continues with a discussion of semiconductor light generators, with a particular focus on edge-emitting and surface-emitting lasers. Photon detectors—of the semiconductor variety—are then discussed. The course ends with a discussion of other important optical components such as modulators, filters, couplers, multiplexers and demultiplexers. Prerequisites: 18-300 and 18-310 and (18-402 or 33-439) and senior or graduate standing.

### **Physics of Applied Magnetism (18-715) – 12 Units**

In this course we address the physics of magnetism of solids with emphasis on magnetic material properties and phenomena which are useful in various applications. Various applications of magnetism are used to motivate the understanding of the physical properties and phenomena. The content of this course includes the origins of magnetism at the atomic level and the origins of magnetic ordering (ferro-, ferri-, and antiferro-magnetism), magnetic anisotropy, magnetic domains, domain walls, spin dynamics and electronic transport at the crystalline level. The principles of magnetic crystal symmetry, tensors, and energy minimization are utilized to explore magnetic properties such as resonance, domain structures, magnetocrystalline anisotropy, magnetostriction and magnetoelasticity, and susceptibility. Phenomenological properties, such as the technical magnetization process, are used to describe mechanisms of coercivity, eddy current effects and losses, while energy minimization and relaxation are used to explain properties such as single domain particle behavior, memory mechanisms, magnetic aftereffects and thermal stability. Prerequisite: 18-300 or equivalent background in electromagnetic fields; Senior level solid state physics and materials, or the equivalent, and a senior or graduate student standing.

### **Advanced Analog Integrated Circuits Design (18-721) – 12 Units**

This course will familiarize students with advanced analog integrated circuit design issues. Analog circuit design issues play an important role in creating modern ICs. First and foremost, analog circuits act as the interface between digital systems and the real world. They act to amplify and filter analog signals, and to convert signals from analog to digital and back again. These analog interfaces appear in all communications devices (e.g., cell phones) both to condition the "transmitted" signal and as sensitive "receivers." In addition, these analog interfaces appear in sensors (e.g., accelerometer). The goal of this course is to familiarize students with some of the advanced analog circuit design ideas that are involved in these tasks. Specific topics will include analog filtering (continuous-time and discrete-time), sample-and-hold amplifiers, analog-to-digital converters, digital-to-analog converters. Prerequisites: 18-623 (was 18-523 before Fall 2005) and senior or graduate standing.

### **RFIC Design and Implementation (18-723) – 12 Units**

This course covers the design and analysis of radio-frequency integrated systems at the transistor level using state of the art CMOS and bipolar technologies. It focuses on system-level trade-offs in transceiver design, practical RF circuit techniques, and physical understanding for device parasitics. Accurate models for active devices, passive components, and interconnect parasitics are critical for predicting high-frequency analog circuit behavior and will be examined in detail. The course will start with fundamental concepts in wireless system design and their impact on design trade-offs in different transceiver architectures. Following that, RF transistor model, passive matching networks will be discussed. Noise analysis and low-noise amplifier design are studied next. The effects of nonlinearity are treated along with mixer design techniques. Practical bias circuit for RF design will be illustrated. Then, the importance of phase noise and VCO design will be considered together. The course will conclude with a brief study of frequency synthesizer and power amplifier design. Senior or graduate standing required.

### **Advanced Digital Integrated Circuit Design (18-725) – 12 Units**

The purpose of this course is to study the design process of VLSI CMOS circuits. This course covers all the major steps of the design process, which include: logic, circuit and layout design. A variety of computer-aided tools are discussed and used in class. The main objective of this course is to provide VLSI design experience that includes design of basic VLSI CMOS functional blocks, verification of the design, testing and debugging. During the course, one complex VLSI project is submitted for fabrication. 4 hrs. lec.

### **Introduction to Computer Security (18-730) – 12 Units**

This course provides a principled introduction to techniques for defending against hostile adversaries in modern computer systems and computer networks. Topics covered in the course include operating system security; network security, including cryptography and cryptographic protocols, firewalls, and network denial-of-service attacks and defenses; user authentication technologies; security for network servers; web security; and security for mobile code technologies, such as Java and Javascript. More advanced topics will additionally be covered as time permits, such as: intrusion detection; techniques to provide privacy in Internet applications; and protecting digital content (music, video, software) from unintended use. Anti-requisites: 18-631 and 18-487

### **Network Security (18-730) – 12 Units**

Some of today's most damaging attacks on computer systems involve exploitation of network infrastructure, either as the target of attack or as a vehicle to advance attacks on end systems. This course provides an in-depth study of network attack techniques and methods to defend against them. Topics include firewalls and virtual private networks; network intrusion detection; denial of service (DoS) and distributed denial-of-service (DDoS) attacks; DoS and DDoS detection and reaction; worm and virus propagation; tracing the source of attacks; traffic analysis; techniques for hiding the source or destination of network traffic; secure routing protocols; protocol scrubbing; and advanced techniques for reacting to network attacks. Prerequisite: 18-630 OR 18-730, and senior or graduate standing.

### **Secure Software Systems (18-732) – 12 Units**

Poor software design and engineering are the root causes of most security vulnerabilities in deployed systems today. Moreover, with code mobility now commonplace--particularly in the context of web technologies and digital rights management--system designers are increasingly faced with protecting hosts from foreign software and protecting software from foreign hosts running it. This class takes a close look at software as a mechanism for attack, as a tool for protecting resources, and as a resource to be defended. Topics covered include the software design process; choices of programming languages, operating systems, databases and distributed object platforms for building secure systems; common software vulnerabilities, such as buffer overflows and race conditions; auditing software; proving properties of software; software and data watermarking; code obfuscation; tamper resistant software; and the benefits of open and closed source development. Senior or graduate standing required.

### **Applied Cryptography (18-733) – 12 Units**

A wide array of communication and data protections employ cryptographic mechanisms. This course explores modern cryptographic (code making) and cryptanalytic (code breaking) techniques in detail. This course emphasizes how cryptographic mechanisms can be effectively used within larger security systems, and the dramatic ways in which cryptographic mechanisms can fall vulnerable to cryptanalysis in deployed systems. Topics covered include cryptographic primitives such as symmetric encryption, public key encryption, digital signatures, and message authentication codes; cryptographic protocols, such as key exchange, remote user authentication, and interactive proofs; cryptanalysis of cryptographic primitives and protocols, such as by side-channel attacks, differential cryptanalysis, or replay attacks; and cryptanalytic techniques on deployed systems, such as memory remanence, timing attacks, and differential power analysis. Senior or graduate standing required.

### **Foundation of Privacy (18-734) – 12 Units**

Privacy is a significant concern in modern society. Individuals share personal information with many different organizations - healthcare, financial and educational institutions, the census bureau, web services providers and online social networks - often in electronic form. Privacy violations occur when such personal information is inappropriately collected, shared or used. We

will study privacy in a few settings where rigorous definitions and enforcement mechanisms are being developed - statistical disclosure limitation (as may be used by the census bureau in releasing statistics), semantics and logical specification of privacy policies that constrain information flow and use (e.g., by privacy regulations such as the HIPAA Privacy Rule and the Gramm-Leach-Bliley Act), principled audit and accountability mechanisms for enforcing privacy policies, anonymous communication protocols - and other settings in which privacy concerns have prompted much research, such as in social networks, location privacy and Web privacy (in particular, online tracking & targeted advertising).

### **Special Topics in Computer Systems: Engineering Safe Software Systems (18-737) – 12 Units**

Modern software systems suffer from poor reliability and security due to overwhelming complexity. Traditional software testing and debugging, which account for more than half the cost of software development, often fail to find critical bugs in software. In recent years there has been an increasing interest in developing automated techniques for improving software reliability. These techniques combine ideas from program analysis, constraint solving, and model checking and have shown great promises in making software more reliable and secure. In this course, we will study these new techniques, with emphasis on automated test-case generation based on symbolic execution and fuzz testing. We will see how these techniques can be used for detecting bugs in software, finding performance bottlenecks, detecting and preventing security vulnerabilities, and analyzing the reliability of software components. We will further study component-based verification and emerging techniques for automated software repair. Finally, we will discuss challenges related to the analysis of systems with deep learning components, which have a simpler structure than more traditional software but tend to be massive in scale. Senior or graduate standing required.

### **Sports Technology (18-738) – 12 Units**

The course's lecture content will cover background material on key aspects of sports technology, including topics such as computer vision, artificial intelligence, data mining, the physics of sports and understanding of real-world systems and guest lectures from experts in the field. The topics covered in depth will include the types of sensors and algorithms used in real-world systems deployments today, as well as new applications of the Internet of Things to different aspects of sports, including training, performance, coaching, etc.

This course also comprises a semester-long project experience and research paper geared towards the development of skills to design realistic and practical embedded/mobile systems and applications that enhance various aspects of the training, coaching, playing and scouting of different sports, including football, hockey, baseball, soccer, etc. Students will work in teams on a project that will involve the hands-on design, configuration, engineering, implementation and testing of an embedded-system prototype of an innovative sports technology of their choice. Students will be expected to leverage proficiency and background gained from other courses, particularly with regard to embedded real-time principles, software systems and embedded programming. The project will utilize a synergistic mixture of skills in system architecture, modular system design, software engineering, subsystem integration, debugging and testing. From inception to demonstration of the prototype, the course will follow industrial project



practices, such as version control, design requirements, design reviews, user studies and quality assurance plans. Advanced undergraduate or graduate standing required.

### **Computer Architecture – (18-740) – 12 Units**

The Internet has transformed our everyday lives, bringing people closer together and powering multi-billion dollar industries. The mobile revolution has brought Internet connectivity to the last-mile, connecting billions of users worldwide. But how does the Internet work? What do oft repeated acronyms like "LTE", "TCP", "WWW" or a "HTTP" actually mean and how do they work? This course introduces fundamental concepts of computer networks that form the building blocks of the Internet. We trace the journey of messages sent over the Internet from bits in a computer or phone to packets and eventually signals over the air or wires. We describe concepts that are common to and differentiate traditional wired computer networks from wireless and mobile networks. Finally, we build up to exciting new trends in computer networks such as the Internet of Things, 5-G and software defined networking. Topics include: physical layer and coding (CDMA, OFDM, etc.); data link protocol; flow control, congestion control, routing; local area networks (Ethernet, Wi-Fi, etc.); transport layer; and introduction to cellular (LTE) and 5-G networks. A final project asks you to build a HTTP video server of your own. This course is cross-listed with 18-441 - both editions will share Lectures and Recitations. However, students in the two courses will receive different exams and will have a different project. The students in the two versions of the course will be graded on a separate curve.

### **Computer Architecture and Systems (18-742) – 12 Units**

Historically, the performance and efficiency of computers has scaled favorably (according to "Moore's Law") with improvements at the transistor level that followed a steady trend (so-called "Dennard scaling"). Unfortunately, device scaling has hit a limit on performance and power improvements dictated by physical device properties. To continue to make systems capable, fast, energy efficient, programmable, and reliable in this "post-Dennard" era, computer architects must be creative and innovate across the layers of the system stack. This course begins with a recap of conventional, sequential computer architecture concepts. We will then discuss the end of convention, brought about by the end of Dennard Scaling and Moore's Law, and several trends that these changes precipitated. The first trend is the wholesale shift to parallel computer architectures and systems, covering parallel hardware and software execution models, cache coherence, memory consistency, synchronization, transactional memory, and architecture support for programming, debugging, and failure avoidance. The second trend is the shift to incorporating specialized, heterogeneous components into parallel computer architectures. Topics will include reconfigurable architectures, FPGAs in the datacenter, ASIC accelerators, GPGPU architectures, and the changes to the system stack that these components demand. The third trend is the emergence of newly capable hardware and software systems and new models of computation. Topics will include approximate and neuromorphic computing, intermittent computing, emerging non-volatile memory and logic technologies, and analog and asynchronous architectures, and may include future emerging topics.

### **Energy Aware Computing (18-743) – 12 Units**

This course provides a comprehensive coverage of topics related to energy aware and green computing. While it is widely recognized that power consumption has become the limiting factor in keeping up with increasing performance trends, static or point solutions for power reduction are beginning to reach their limits. This course is intended to provide an insight into: (i) power and energy consumption modeling and analysis; (ii) energy aware computing, i.e., how various power reduction techniques can be used and orchestrated such that the best performance can be achieved within a given power budget, or the best power efficiency can be obtained under prescribed performance constraints; and (iii) green computing in the context of large scale computing systems or smart grid-aware computing. Recommended: basic VLSI design, basic computer system organization, basic compiler design and OS knowledge. Prerequisites: Senior or Graduate Standing.

### **Connected Embedded Systems Architecture (18-744) – 12 Units**

Connected Embedded Systems Architecture (CESA) is a one-semester lab-based course that addresses the core concepts of modern embedded systems with a particular emphasis on the emerging field of apps that span small, embedded devices (including wearable electronics, so-called Internet of Things devices, and mobile phones) to the cloud. We will examine the evolution of the nature of IoT from the early days of wireless sensor networks to the future vision of federated, time-synchronized, scalable, virtualized "fog computing" platforms.

The course is designed to take a systems approach and, as such, will include relevant topics from both software (cloud, network, device) and hardware (network and device). The course content is aimed at systems engineers who wish to architect, develop and deploy cloud-connected embedded systems in which the "apps" change, mature and evolve over time. The course stresses the creation of engineering frameworks in which tradeoffs can be rationally made between computing and storage that should be done on coin-cell-powered devices vs. computing and storage that should be done in the network or in the cloud.

### **Rapid Prototyping of Computer Systems (18-745) – 12 Units**

This is a project-oriented course which will deal with all four aspects of project development; the application, the artifact, the computer-aided design environment, and the physical prototyping facilities. The class, in conjunction with the instructors, will develop specifications for a mobile computer to assist in inspection and maintenance. The application will be partitioned between human computer interaction, electronics, industrial design, mechanical, and software components. The class will be divided into groups to specify, design, and implement the various subsystems. The goal is to produce a working hardware/software prototype of the system and to evaluate the user acceptability of the system. We will also monitor our progress in the design process by capturing our design escapes (errors) with the Orthogonal Defect Classification (ODC). Upon completion of this course the student will be able to: generate systems specifications from a perceived need; partition functionality between hardware and software; produce interface specifications for a system composed of numerous subsystems; use computer-aided design tools; fabricate, integrate, and debug a hardware/software system; and evaluate the system in the context of an end user application. This course is cross-listed as 18540.

### **Storage Systems (18-746) – 12 Units**

This course covers the design, implementation, and use of storage systems, from the characteristics and operation of individual storage devices through the OS, database, and networking approaches involved in tying them together and making them useful to key applications' demands and technology trends. Topics to be covered include: network-attached storage, disk arrays, storage networking, storage management, advanced file systems, disk performance enhancement, wide-area data sharing, and storage security. 3 hrs. lec. The class will continue to be like previous years, with the same advanced content and high-level expectations.

### **Wireless Device Architecture (18-747) – 12 Units**

Growth of the Internet of Things depends on semiconductor devices  $\zeta$  systems-on-chip (SoC)  $\zeta$  with significant computational, communications and sensing capabilities. Integration of entire systems on one or a very small number of dies has made it possible to deploy hundreds of billions of end-points that will link the cyber world with the physical world. At this scale, a key design requirement is that such devices can be handled at most once during their lifetime. Batteries should be life-long, and reprogramming should be over-the-air. How then should such devices be architected? We begin by examining modern digital communications including modulation and coding schemes, basic RF subsystems and antennas. We examine the computational structures that allow us to reduce communication to computation. Anticipating that such devices will need to be highly programmable, we consider concepts from traditional computer architecture and their applicability to this energy-constrained domain. We also examine the rapid evolution of transducer technologies and how these are being integrated into SoCs. Then, we consider how an architect can make tradeoffs across these domains to meet design objectives. Students will take advantage of a purpose-built experimental platform called PowerDué that enables deep exploration of these topics in realistic applications. Background in computer architecture, signals and systems, and E&M field theory is recommended. Graduate standing is required to register for this course.

### **Wireless Sensor Networks (18-748) – 12 Units**

The use of distributed wireless sensor networks have surged in popularity in recent years with applications ranging from environmental monitoring, to people- and object-tracking in both cooperative and hostile environments. This course is targeted at understanding and obtaining hands-on experience with the state of the art in such wireless sensor networks which are often composed using relatively inexpensive sensor nodes that have low power consumption, low processing power and bandwidth. The course will span a variety of topics ranging from radio communications, network stack, systems infrastructure including QoS support and energy management, programming paradigms, distributed algorithms and example applications. Some guest lectures may be given. Each discussion-oriented lecture will be preceded by the reading of 1-2 papers, resulting in a rich collection of papers by the end of the semester. Early in the semester, hands-on exercises will be used to teach the programming of FireFly sensor nodes by using the 'nano-RK' power-aware sensor real-time operating system (RTOS) and using 802.15.4 radio communications. Then, project groups of no more than 3 students will define, design, implement and test a sensor network project. Final in-class project presentations will be

supplemented by a written report. A final exam may be conducted to evaluate the students' understanding of the materials covered. Grading criteria will include classroom participation, course project content and report, and a final exam. Class size will be limited to 20 students or less. Hands-on experience with network programming, operating systems and assembly language are essential. Exceptions only with explicit permission of instructor. Prerequisites: 15-213 and ((18-348 or 18-349) or 15-410), and senior or graduate standing.

### **Building Reliable Distributed Systems (18-749) – 12 Units**

The course provides an in-depth and hands-on overview of designing and developing reliable distributed systems, throughout a system's lifecycle, starting from fault-tolerant design and execution (replication, group communication, databases) to fault-recovery (fault-detection, logging, check-pointing, failure-diagnosis) for various classes of faults (crashes, communication errors, software upgrades). The course will cover real-world practices for reliability, supplemented by case studies of large-scale downtime incidents. The concepts will be taught in the context of contemporary cloud-computing platforms, and the course will include a hands-on project that involves the design, implementation and empirical evaluation of a reliable distributed cloud-based system. Students will be taught to write, review, and present a conference-style research paper by the end of the semester, with the goal of documenting the design, lessons learned and experimental results of their team project. Students can expect to learn about the reliability issues underlying cloud computing, the tools and best practices for implementing and evaluating reliability, and the strengths and weaknesses of current cloud-computing platforms from the perspective of reliability. Prerequisites: Graduate standing or instructor permission

### **Wireless Networks and Applications (18-750) – 12 Units**

This course introduces fundamental concepts of wireless networks. The design of wireless networks is influenced heavily by how signals travel through space, so the course starts with an introduction to the wireless physical layer, presented in a way that is accessible to a broad range of students. The focus of the course is on wireless MAC concepts including CSMA, TDMA/FDMA, and CDMA. It also covers a broad range of wireless networking standards, and reviews important wireless network application areas (e.g., sensor networks, vehicular) and other applications of wireless technologies (e.g., GPS, RFID, sensing, etc.). Finally, we will touch on public policy issues, e.g., as related to spectrum use. The course will specifically cover: Wireless networking challenges Wireless communication overview Wireless MAC concepts Overview of cellular standards and LTE Overview of wireless MAC protocols WiFi, bluetooth and personal area networks, etc. Wireless in today's Internet: TCP over wireless, mobility, security, etc. Advanced topics, e.g., mesh and vehicular networks, sensor networks, DTNs, localization, sensing, etc. Although students in 18-750 will share Lectures and Recitations with students in 18-452, they will receive distinct homework assignments and exams from students in 18-452. The main project will also be different. The students in the two version of the course will also be graded on a separate curve.

### **Applied Stochastic Processes (18-751) – 12 Units**

Basic probability concepts : Probability space, simple and compound events, statistical independence, and Bayes Rule. Total Probability Concept; Bernoulli trials; Poisson Law. De Moivre-Laplace Theorem. Definition of a Random Variable (RV); Probability distribution of an RV: cumulative distribution function (CDF) and probability density function (PDF). Two Random Variables; several Random Variables. Functions of RVs; conditional distributions; conditional expectations; joint distributions. Moments, generating functions, and characteristic functions of RVs. Chebyshev inequality. Estimation; linear estimation; minimum mean square estimation; and orthogonality principle. Limit theorems; Central Limit Theorem; Law of Large Numbers (both strong LLN and Weak LLN). Definition of a Random Process (RP). Different notions of stationarity. Poisson and Gaussian processes. Autocorrelation and Power Spectral Density (PSD) of an RP. Processing of random (stochastic) processes by linear systems. Ergodicity. Spectral analysis. Matched Filtering. Selected applications from telecommunications, data networking (queuing), Kalman filtering.

### **Estimation, Detection and Learning (18-752) – 12 Units**

This course discusses estimation, detection, identification and machine learning, covering a variety of methods, from classical to modern. In detection, the topics covered include hypothesis testing, Neyman-Pearson detection, Bayesian classification and methods to combine classifiers. In estimation, the topics include maximum-likelihood and Bayesian estimation, regression, prediction and filtering, Monte Carlo methods and compressed sensing. In identification and machine learning, topics include Gaussian and low-dimensional models, learning with kernels, support vector machines, neural networks, deep learning, Markov models and graphical models.

### **Information Theory (18-753) – 12 Units**

The first half of the course comprises of the concepts of entropy, mutual information, the Asymptotic Equipartition property, applications to source coding (data compression), applications to channel capacity (channel coding), differential entropy and its application to waveform channel capacities, and a subset of advanced topics such as network information theory, or rate-distortion theory, as time permits. The second half of the course comprises finite-field algebra, Hamming codes, cyclic codes (CRC and BCH codes), a brief introduction to Reed-Solomon codes, and perhaps universal codes (Lempel-Ziv coding). Prerequisites: 36-217 and senior or graduate standing.

### **Error Control Coding: Theory and Applications (18-754) – 12 Units**

Modern digital communication systems and digital data storage systems owe their success, in part to the use of error control coding. By careful insertion of redundant bits or symbols in the transmitted or stored bit streams, the receiver can detect and correct errors induced by channel impairments such as noise, inter-symbol interference and noise. For example, compact disc (CD) owes its ruggedness to the use of cross-interleaved Reed-Solomon (CIRC) code. High-speed networks employ Cyclic Redundancy Check (CRC) to ensure that the data was transmitted accurately. This course is aimed at introducing the basic theory and select applications of error control coding (ECC). Towards that goal, following topics will be covered. Mathematical background Linear block codes Low density parity check (LDPC) codes Cyclic codes Reed-Solomon

(RS) codes Convolutional codes Turbo codes Example application of ECC in digital communications Example application of ECC in digital data storage.

### **Networks in the Real World (18-755) – 12 Units**

18-755 is a graduate-level course that focuses on networks and their applications to various natural and technological systems. Specifically, this class delves into the new science behind networks and their concrete applications technological, biological, and social systems, as well as various design synergies that exist when looking at these systems from a cyber-physical perspective. By scope and contents, this is not just another class on "networks". Want to know how complex networks dominate our world? How communities arise in social networks? How group behavior dominates Twitter? How swarms of bacteria can navigate inside the human body? How patterns of interaction can be identified in hardware and software systems? Want to work on cutting edge projects involving systems and synthetic biology? Or social networks? Or networks-on-chip and internet-of-things? Then this class is for you! Course requirements consist of a few homework assignments, a semester-long project, and in-class presentations of relevant papers. By structure and contents, this class targets primarily the computer engineering and computer science students, but it also provides a valuable foundation for interdisciplinary research to students in related disciplines. Senior or graduate standing is required to take this course.

### **Packet Switching and Computer Networks (18-756) – 12 Units**

This course is designed to provide graduate students an understanding of the fundamental concepts in computer networks of the present and the future. In the past, the scarce and expensive resource in communication networks has been the bandwidth of transmission facilities. Accordingly, the techniques used for networking and switching have been chosen to optimize the efficient use of this resource. These techniques have differed according to the type of information carried: circuit switching for voice and packet switching for data. It is expected that elements of circuit and packet switching will be used in the integrated networks. This course focuses on packet switching for computer networks and protocol design. Topics in the course include: computer networks over-view; OSI layers, queuing theory; data link protocol; flow control; congestion control; routing; local area networks; transport layer. The current networks and applications will be introduced through the student seminars in the last weeks of the course. 4 hrs. lec. Prerequisites: 18-345 and senior or graduate standing.

### **Network Management and Control (18-757) – 12 Units**

This course provides an understanding of the principles of broadband networks. The broadband networks differ from currently existing communication networks in many aspects and these issues will be dealt with in the course. Broadband networks are designed to support many different services, ranging from low bandwidth (telemetry) to high bandwidth applications (digitized video). The course will cover the underlying concepts of the broadband networks, and expose the research problems in next generation networks. Many concepts (ATM, SONET, MPLS, high-speed switching architecture, high-speed network control, unified control plane (GMPLS), and optical networks) will be discussed. The course project will explore latest network

technologies, design networking systems, and evaluate via simulation techniques. 4 hrs. lec.  
Prerequisites: A course in probability; 18-756 and senior or graduate standing.

### **Wireless Communications (18-758) – 12 Units**

In this course, the communication problem will be introduced, and channel impairments such as noise, inter-symbol interference and fading will be described. Solutions to combat these impairments, based on digital communication theory, will be described. These will include signal space analysis, detection, equalization, coding and diversity. Examples drawn from communication standards will illustrate how the theory is implemented in practical communication systems.

### **Wireless Networks (18-759) – 12 Units**

In this course, we will do a quick review of wireless communications and networking principles which will be the basis of more advanced work and research. The emphasis will be on understanding the impact of mobility and connectivity that can be provided or supported by different wireless networks. To this end, wireless communications standards such as GSM (2G), 3G, 4G, and the ongoing work on 5G in addition to key wireless technologies such as Bluetooth, WiFi, Zigbee, RFID, and WiMax will be reviewed. Then, we will study the key papers in the following hot topics in wireless networking: 1) Ad Hoc Wireless Networks and Sensor Networks; 2) Self-organizing networks and adaptive complex networks; 3) Cognitive Networks; 4) Vehicular Ad Hoc Networks; 5) Social Networks; 6) The challenges of 5G wireless networks; 7) Internet of Things (IoT); 8) Role of Artificial Interference (AI ) and Machine Learning (ML) in wireless networks.

### **VLSI CAD: Logic to Layout (18-760) – 12 Units**

A large digital integrated circuit (IC) may require 100,000 lines of high-level description in a hardware modeling language, which then turns into 10,000,000 logic gates, which ultimately end up as 1 billion polygons on the masks that define the integrated circuit. This course describes in detail the important CAD tools that perform the many steps of the transformation from Boolean equations to fabrication masks. We focus on mathematical models, algorithms, and data structures. We will write programs for simple versions of these tools. We will look at, and experiment with, a few real tools. The course covers a review of Boolean algebra, followed by (i) synthesis tools for 2-level and multi-level logic, that transform Boolean equations and finite state machine descriptions into optimized logic, and (ii) verification tools that decide whether the logic you built does the same thing as the specification you started with. Finally, the course covers geometric layout synthesis tools for component partitioning, placement, and wire routing and timing verification tools that determine if performance constraints are met. The CAD algorithms covered in the lectures are applicable not only to VLSI systems, but also to non-silicon applications (e.g., social computing, biology, financial).

### **Circuit Simulation: Theory and Practice (18-762) – 12 Units**

This course explores the models, numerical methods and algorithms that are used for simulation and optimization of circuits. The course begins with coverage of the algorithms that are used in the ubiquitous SPICE program and its many variants. This is followed by an overview of the

numerous analog and digital simulation techniques that have followed since the introduction of SPICE. The course further covers some of the most recent modeling and simulation work including, but not limited to, model order reduction, harmonic balance methods, nonlinear macromodeling, compact device modeling, and statistical timing analysis. Finally, the use of circuit simulation algorithms for non-circuit problems will be explored. 4 hrs. lec.

### **Digital System Testing and Testable Design (18-675) – 12 Units**

For this course, time- and topic-indexed videos of lecture, homework, projects, etc. will be available from the online learning portal/website. In addition to these resources, two 1-hour live sessions are scheduled per week for recitation. Each student is strongly urged to attend one of these two sessions each week, either remotely or in the classroom on the Carnegie-Mellon Pittsburgh campus. This course examines in depth the theory and practice of fault analysis, test generation, and design for testability for digital ICs and systems. The topics to be covered include circuit and system modeling; fault sources and types; the single stuck-line (SSL), delay, and functional fault models; fault simulation methods; automatic test pattern generation (ATPG) algorithms for combinational and sequential circuits, including the D-algorithm, PODEM, FAN, and the genetic algorithm; testability measures; design-for-testability; scan design; test compression methods; logic-level diagnosis; built-in self-testing (BIST); VLSI testing issues; and processor and memory testing. Advance research issues, including topics on MEMS and mixed-signal testing are also discussed. 4 hours of lecture per week Prerequisites: 18-240 and 15-211 and (18-340 or 18-341) Senior or graduate standing required.

### **Linear Systems (18-771) – 12 Units**

A modern approach to the analysis and engineering applications of linear systems. Modeling and linearization of multi-input-- multi-output dynamic physical systems. State-variable and transfer function matrices. Emphasis on linear and matrix algebra. Numerical matrix algebra and computational issues in solving systems of linear algebraic equations, singular value decomposition, eigenvalue-eigenvector and least-squares problems. Analytical and numerical solutions of systems of differential and difference equations. Structural properties of linear dynamic physical systems, including controllability, observability and stability. Canonical realizations, linear state-variable feedback controller and asymptotic observer design. Design and computer applications to electronic circuits, control engineering, dynamics and signal processing. 4 hrs. lec. Pre-Req: 18-470 or 18-474 and Graduate standing in CIT or MCS.

### **Non Linear Control (18-776) – 12 Units**

This course provides an introduction to the analysis and design of nonlinear systems and nonlinear control systems; stability analysis using Lyapunov, input-output and asymptotic methods; and design of stabilizing controllers using a variety of methods selected from linearization, vibrational control, sliding modes, feedback linearization and geometric control. 4 hrs. lec.

### **Complex Large-Scale Dynamic Systems (18-777) – 12 Units**

This course is motivated by the ever-growing complexity of man-made dynamic systems and the need for flexible monitoring, operations and design techniques for such systems. Of particular interest are systematic model-based methods for relating the key real-life problems for such



systems and the state-of-the-art techniques for large-scale dynamic systems. Examples of such real-life complex systems are critical man-made infrastructure systems (electric power systems, gas networks, transport industries, data networks, and their interdependencies) as well as large-scale systems on chips. In this course we will first review the traditional large-scale methods for model simplification (aggregation), time scale separation of sub-processes and singular perturbation techniques to account for these, stability analysis, and estimation and control. In the second, novel part of this course, we recognize the highly interactive nature of the evolving complex systems, in which much monitoring, data gathering, and decision making is made at the lower, physical levels of the system, and some coordination exists at the higher system level at which physical layers interact. Several conceptual challenges are posed for minimal coordination of such decision makers under high uncertainties, in order to have predictable performance. These concepts will be illustrated using the same man-made network systems of interest introduced at the beginning of the course. Requirements: Some background in dynamic systems is highly desirable. Students interested in large-scale real-life complex systems, their relation to the state-of-the-art methods available and new research challenges will gain from taking this course. 4 hrs lec. Prerequisites: senior or graduate standing.

### **Speech Recognition and Understanding (18-781) – 12 Units**

The technology to allow humans to communicate by speech with machines or by which machines can understand when humans communicate with each other is rapidly maturing. This course provides an introduction to the theoretical tools as well as the experimental practice that has made the field what it is today. We will cover theoretical foundations, essential algorithms, major approaches, experimental strategies and current state-of-the-art systems and will introduce the participants to ongoing work in representation, algorithms and interface design. This course is suitable for graduate students with some background in computer science and electrical engineering, as well as for advanced undergraduates. Prerequisites: Sound mathematical background, knowledge of basic statistics, good computing skills. No prior experience with speech recognition is necessary. This course is primarily for graduate students in LTI, CS, Robotics, ECE, Psychology, or Computational Linguistics. Others by prior permission of instructor.

### **Machine Learning (18-782) – 12 Units**

Machine Learning is a foundational discipline of the Information Sciences. It combines elements from Mathematics, Computer Science, and Statistics with applications in Biology, Physics, Engineering and any other area where automated prediction is necessary. The aim of the course is to present some of the topics which are at the core of modern Machine Learning, from fundamentals to state-of-the-art methods. Emphasis will be put both on the essential theory and on practical examples and lab projects. Each exercise has been carefully chosen to reinforce concepts explained in the lectures or to develop and generalize them in significant ways. This course is directed both at students without previous knowledge in Machine Learning, and at those wishing to broaden their expertise in this area. The course assumes some basic knowledge of probability theory and linear algebra. Nevertheless, the first module of the course will revisit these topics. Students are also expected to have knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program. Students who have already taken CS 10-701/15-781 or ECE 18-697 should not take this course.

### **Data, Inference, and Applied Machine Learning (18-785) – 12 Units**

Please see the ECE website <https://www.ece.cmu.edu/> for more information. This course will provide the methods and skills required to utilize data and quantitative models to automate predictive analytics and make improved decisions. From descriptive statistics to data analysis to machine learning the course will demonstrate the process of collecting, cleaning, interpreting, transforming, exploring, analyzing and modeling data with the goal of extracting information, communicating insights and supporting decision-making. The advantages and disadvantages of linear, nonlinear, parametric, nonparametric and ensemble methods will be discussed while exploring the challenges of both supervised and unsupervised learning. The importance of quantifying uncertainty, statistical hypothesis testing and communicating confidence in model results will be emphasized. The advantages of using visualization techniques to explore the data and communicate the outcomes will be highlighted throughout. Applications will include visualization, clustering, ranking, pattern recognition, anomaly detection, data mining, classification, regression, forecasting and risk analysis. Participants will obtain hands-on experience during project assignments that utilize publicly available datasets and address practical challenges.

### **Wavelets and Multiresolution Techniques (18-790) – 12 Units**

The goal of this course is to expose students to multiresolution signal processing methods and their use in real applications as well as to guide them through the steps of the research process. All the necessary mathematical tools are introduced with an emphasis on extending Euclidean geometric insights to abstract signals; the course uses Hilbert space geometry to accomplish that. With this approach, fundamental concepts---such as properties of bases, Fourier representations, sampling, interpolation, approximation, and compression---are often unified across finite dimensions, discrete time, and continuous time, thus making it easier to focus on the few essential differences. The course covers signal representations on sequences, specifically local Fourier and wavelet bases and frames. It covers the two-channel filter bank in detail, and uses this signal-processing device as the implementation vehicle for all sequence representations that follow. The local Fourier and wavelet methods are presented side-by-side, without favoring any one in particular. Through the project, students will learn how to choose an appropriate representation and apply it to the specific problem at hand. There will be 2-3 hours of pre-recorded video per week that can be viewed online at any time. There will also be two 1-hour sessions in person that are not mandatory and can be viewed later online. The instructor will also be available for meetings in person or online as needed. The total amount of work per week is expected to be around 12 hours on average Pre-requisite: 18-491. Students are expected to have a good background in basic engineering mathematics, signal processing and linear algebra. This course is cross listed with 42-732

### **Methods in Medical Image Analysis (18-791) – 12 Units**

Students will gain theoretical and practical skills in medical image analysis, including skills relevant to general image analysis. The fundamentals of computational medical image analysis will be explored, leading to current research in applying geometry and statistics to segmentation, registration, visualization, and image understanding. Student will develop practical experience

through projects using the National Library of Medicine Insight Toolkit (ITK), a popular open-source software library developed by a consortium of institutions including Carnegie Mellon University and the University of Pittsburgh. In addition to image analysis, the course will include interaction with clinicians at UPMC. It is possible that a few class lectures may be videoed for public distribution. Prerequisites: Knowledge of vector calculus, basic probability, and either C++ or python.

### **Advanced Digital Signal Processing (18-792) – 12 Units**

This course will examine a number of advanced topics and applications in one-dimensional digital signal processing, with emphasis on optimal signal processing techniques. Topics will include modern spectral estimation, linear prediction, short-time Fourier analysis, adaptive filtering, plus selected topics in array processing and homomorphic signal processing, with applications in speech and music processing. 4 hrs. lec.

### **Image and Video Processing (18-793) – 12 Units**

This course covers signal processing techniques specialized for handling 2D (images) and 3D (videos) signals. It builds upon 1D signal processing techniques developed in 18-290 and 18-491 and specializes them for the case of images and videos. In this class, you will learn fundamental tools and techniques for processing images and videos, and will learn to apply them to a range of practical applications. This course provides the fundamentals for studying images and videos. We will develop signal models specific to images and videos, develop associated optimization techniques for solving restoration problems like denoising, inpainting, study specialized compression algorithms. Specific focus will be on transform-domain, PDE and sparsity-based models and associated optimization techniques. These formal techniques will be enriched via applications in mobile devices, medical image processing, and compressive sensing.

### **Pattern Recognition Theory (18-794) – 12 Units**

Decision theory, parameter estimation, density estimation, non-parametric techniques, supervised learning, linear discriminant functions, clustering, unsupervised learning, artificial neural networks, feature extraction, support vector machines, and pattern recognition applications (e.g., face recognition, fingerprint recognition, automatic target recognition, etc.). 4 hrs. lec. Prerequisites: 36-217, or equivalent introductory probability theory and random variables course and an introductory linear algebra course and senior or graduate standing.

### **Bioimage Informatics (18-795) – 12 Units**

Bioimage Informatics (formerly Bioimaging) 12 units This course gives an overview of tools and tasks in various biological and biomedical imaging modalities, such as fluorescence microscopy, electron microscopy, magnetic resonance imaging, ultrasound and others. The major focus will be on automating and solving the fundamental tasks required for interpreting these images, including (but not restricted to) deconvolution, registration, segmentation, pattern recognition, and modeling, as well as tools needed to solve those tasks (such as Fourier and wavelet methods). The discussion of these topics will draw on approaches from many fields, including statistics, signal processing, and machine learning. As part of the course, students will be expected to complete an independent project. Prerequisites: 18-396 Signals and Systems

### **Machine Learning for Signal Processing (18-797) – 12 Units**

Signal Processing is the science that deals with extraction of information from signals of various kinds. This has two distinct aspects -- characterization and categorization. Traditionally, signal characterization has been performed with mathematically-driven transforms, while categorization and classification are achieved using statistical tools. Machine learning aims to design algorithms that learn about the state of the world directly from data. A increasingly popular trend has been to develop and apply machine learning techniques to both aspects of signal processing, often blurring the distinction between the two. This course discusses the use of machine learning techniques to process signals. We cover a variety of topics, from data driven approaches for characterization of signals such as audio including speech, images and video, and machine learning methods for a variety of speech and image processing problems. Prerequisites: Linear Algebra, Basic Probability Theory, Signal Processing and Machine Learning. 18-797 is a cross listing of 11-755 offered by LTI.

### **Fundamentals of Semiconductors and Nanostructures (18-817) – 12 Units**

This course is designed to provide students with a foundation of the physics required to understand nanometer-scale structures and to expose them to different aspects of on-going research in nanoscience and nanotechnology. Illustrative examples will be drawn from the area of semiconductor nanostructures, including their applications in novel and next-generation electronic, photonic, and sensing devices. The course begins with a review of basic concepts in quantum physics (wave-particle duality, Schrödinger's equation, particle-in-a-box, approximation methods in quantum mechanics, etc.) and then continues with a discussion of bulk three-dimensional solids (band structure, density of states, the single-electron effective-mass approximation). Size effects due to nanometer-scale spatial localization are then discussed within a quantum-confinement model in one-, two-, and three- dimensions for electrons. An analogous discussion for photons is also presented. The basic electronic, optical, and mechanical properties of the low-dimensional nanostructures are then discussed. A select number of applications in electronics, photonics, biology, chemistry, and bio-engineering will be discussed to illustrate the range of utility of nanostructures. Upon completion of the course, students will have an appreciation and an understanding of some of the fundamental concepts in nanoscience and nanotechnology. The course is suitable for first-year graduate students in engineering and science (but advanced undergraduates with appropriate backgrounds may also take it with permission from the instructor). Prerequisites: 09-511, 09-701, 09-702, 18-303, 18-310, 18-402, 27-770, 33-225, 33-234 or familiarity with the material or basic concepts covered in these courses and senior or graduate standing.

### **Mobile and Pervasive Computing (18-843) – 12 Units**

This is a course exploring research issues in the newly emerging field of mobile computing. Many traditional areas of computer science and computer engineering are impacted by the constraints and demands of mobility. Examples include network protocols, power management, user interfaces, file access, ergonomics, and security. This will be an "advanced" course in the truest sense --- most, if not all, the topics discussed will be ones where there is little consensus in the research community on the best approaches. The course will also offer significant "hand-on"

experience in this area. Each student will have to present and lead the discussion on a number of papers. Students will work in groups of three under the guidance of a mentor on a hands-on project. Each student will also be required to write one of two documents: (a) a research proposal (similar in spirit to an NSF proposal) on an idea in mobile computing or (b) a short business plan for a commercial opportunity in mobile computing. Grading will be based on the quality of the presentations, the project, and the proposal or business plan. Prerequisites: 15-410 and senior or graduate standing.

### **Internet Services (18-845) – 12 Units**

This course investigates the issues involved in providing scalable and highly available network services over the best-effort Internet. Examples of such services include Web servers, application servers, search engines, proxy caches, online auction systems, and remote visualization. Topics include network programming, server design, clustering, caching, proxies, remote execution, resource naming, discovery, and monitoring, and wide-area metacomputing. The course consists of lectures on existing technology, student presentations of research papers, and a project where students design and implement a significant network service.

### **Wireless Systems Design Experience (18-846) – 12 Units**

This project-oriented course is the culmination of the MS ECE Wireless Systems Concentration. It provides third-semester students with a design experience that brings together concepts from the Wireless Systems core to solve a real-world problem.

The class organizes the students as a design team to build an outdoor system for distributed sensing of physical quantities, wireless connectivity to a data repository, and analysis and presentation of the data. The specific problem domains (e.g., pavement-mounted traffic sensors, sensors for overland water flow, soil moisture, or stream height) are selected to present specific challenges in wireless connectivity, low-power operation, distributed synchronization, federation of dissimilar sensor types, real-time computation, and information presentation. The instructors and project sponsors (customers) will guide the students in developing an understanding of the problem domain (environment and requirements) and selecting suitable technologies for addressing the challenges specific to it, creating and documenting a system architecture with verifiable interfaces, decomposing the architecture into sub-problems that sub-groups of students can address, integrating the results into a single system, and verifying system performance against the documented requirements. Consistent with the Wireless Systems concentration methodologies, student work will be organized around fixed-length sprints followed by an evaluation of progress with the customer and instructors.

Upon completion of this course, the student will be able to: generate systems specifications from a perceived need; partition functionality between hardware and software; produce interface specifications for a system composed of wirelessly-connected subsystems; use power and RF modeling tools; fabricate, integrate, and debug a hardware/software system; and evaluate the system in the context of an end user application.

### **Engineering and Economics of Electric Energy Systems (18-875) – 12 Units**

The course has two parts. The first part introduces basic components and networks used in the electric power industry. This is followed by systematic modeling of these components, as well as of the entire system. Methods for modeling and analyzing both system equilibria and dynamics are presented. Simulations and lab demos are given to simulate and analyze typical system blackouts. This is followed by introducing decision and control methods for preventing these problems, as well as for managing the system more reliably, securely and efficiently over broad ranges of its operating conditions. The emphasis is on IT, software and control (both distributed and coordination) for achieving pre-specified system performance. This part of the course will involve simulation demos and hands on studies in which students create their own power network, simulate it and assess for performance. The second part of the course will review the industry structure, the experience with deregulation, and economic issues concerning choice of generating fuel and technology, the costs of blackouts, and environmental discharges. The course will integrate engineering and economic aspects to examine the design, investment, and operations that satisfy public desires for low cost, nonpolluting, reliable, and secure power. Knowledge of basic electric circuits and/or basic economics is assumed. 3 hrs. lec., 1 hr. rec. Prerequisites: Basic electric circuits and/or basic economics and at least graduate standing.

### **M.S. Graduate Project (18-980) – Variable Units**

Master's level research.

### **Introduction to Graduate Studies (18-989) – 1 Unit**

The Introduction to Graduate Studies course is designed to increase awareness and understanding of academic integrity issues, Carnegie Mellon community standards and the ethical job search. This is done via various sessions/modules that are already offered via several entities throughout campus (such as the CPDC, ICC, and GCC). Topics covered include: paraphrasing and citation, participating in the US classroom, avoiding plagiarism, unconscious bias, combating sexual violence on campus, finding jobs and internships, negotiation, communication, relationship building and other topics of interest. The course culminates in students writing a reflection paper. For international students, the paper should compare western academic and cultural standards to those of their home country. For domestic students, the paper should be a reflection on CMU's community standards. Active participation in various sessions/modules in the above mentioned areas and the submission of the reflection paper will determine a pass/fail grade.

### **Internship for Electrical and Computer Engineering MS Students (18-994) – 3 Units**

The Department of Electrical and Computer Engineering considers experiential learning opportunities important educational options for its graduate students. One such option is an internship, normally completed during the summer. The ECE Graduate Office will add the course to the student's schedule. This process should be used by any Electrical and Computer Engineering graduate student wishing to have their internship experience reflected on their official University transcript. International students should also be authorized by the Office of International Education (OIE). Completion of written assignments and requirements will determine the letter grade for the course. Prerequisites: Graduate standing in ECE

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## APPENDIX D: ADDITIONAL INFORMATION ON FEDERAL AND STATE AID / FINANCIAL AID POLICIES

### Carnegie Mellon University Consumer Information

Below is a summary of consumer information made available to all Carnegie Mellon University prospective and current students as required by the Higher Education Act of 1965, as amended. Required Disclosures have been categorized into five topics. Each disclosure gives a brief description of information that is required to be disclosed and explains how it can be obtained. This information may be changed from time to time as required.

If you need assistance or would like a paper copy, contact the Student Financial Aid Office, 5000 Forbes Avenue, Warner Hall, Pittsburgh, PA. If you wish to speak with a representative about the information contained here, please contact Associate Director Catherine Demchak at (412) 268-1353.

### Information about the Institution:

#### Accreditation Information

Carnegie Mellon University is accredited by the Middle States Commission on Higher Education (MSCHE), 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104 ([www.msche.org](http://www.msche.org)). The Commission may be contacted by telephone at 267-284-5000 or via email at [info@msche.org](mailto:info@msche.org) or [espanolinfo@msche.org](mailto:espanolinfo@msche.org) (Spanish/Español). The university's current "Statement of Accreditation Status" can be found at, <https://www.msche.org/institution/>.

#### State Approvals

Carnegie Mellon University is licensed to operate in the states listed below. Individuals may contact the relevant agency for more information or information about how to file a complaint.

#### **California**

Bureau for Private Postsecondary Education  
1747 North Market Blvd, Suite 225,  
Sacramento, CA 95834  
Telephone: (916) 574-8900  
Email: [bppe@dca.ca.gov](mailto:bppe@dca.ca.gov)  
Website: [www.bppe.ca.gov](http://www.bppe.ca.gov)

#### **New York**

New York State Education Department  
Office of Higher Education  
Room 977 Education Building Annex  
Albany, NY 12234  
Telephone: 518-486-3633  
Email: [hedepcom@nysed.gov](mailto:hedepcom@nysed.gov)  
Website: [www.highered.nysed.gov](http://www.highered.nysed.gov)

#### **Pennsylvania**



Pennsylvania Department of Education  
Office of Postsecondary and Higher Education  
333 Market Street, 12th Floor  
Harrisburg, PA 17126-0333  
Telephone: 717-783-8228  
Email: [ra-collunivseminfo@pa.gov](mailto:ra-collunivseminfo@pa.gov)  
Website: [www.education.state.pa.us](http://www.education.state.pa.us)

### **Washington, D.C.**

Office of the State Superintendent of Education  
Government of the District of Columbia  
810 First Street NE 9th Floor  
Washington, DC 20002  
Telephone: 202-727-6436  
Email: [osse@dc.gov](mailto:osse@dc.gov)  
Website: [osse.dc.gov](http://osse.dc.gov)

Inquiries regarding the university's accreditation status or authorization to operate in any of the above states may be directed to: Associate Vice President / Director of Enrollment Services, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh PA 15213, telephone: 412-268-5399, email: [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu).

### Distance Education, State Authorization and Reciprocity Agreement (SARA)

The State Authorization Reciprocity Agreement (SARA) is an agreement among member states, districts, and territories in the United States, which establishes national standards for interstate offering of postsecondary distance education courses and programs. It is intended to standardize the process of offering online courses and programs by postsecondary institutions located in states other than the state in which the enrolled student(s) are residing. SARA is overseen by a national council (NC-SARA) and administered by four regional education compacts.

Carnegie Mellon University has been approved by the Commonwealth of Pennsylvania to participate in NC-SARA and was accepted as a SARA institution on May 2, 2017; additionally, Carnegie Mellon secured approval through NC-SARA on May 18, 2017. Carnegie Mellon University is listed as an approved, participating institution on the NC-SARA website (<http://www.nc-sara.org/>). At this time, 49 of the 50 United States are SARA members. California is not a member of SARA; however, Carnegie Mellon is able to offer online education to California residents.

Except where prohibited by applicable law, students who reside outside of the United States generally are not restricted from enrolling in our online programs. Some online programs do require in-person attendance at one of Carnegie Mellon's teaching locations (e.g., Carnegie Mellon's Pittsburgh, Pennsylvania campus) for short portions of the program. Students interested in enrolling in a specific online program are encouraged to contact the person designated by the online program for questions about the program's requirements or enrollment.

## Copyright Infringement Policies

Carnegie Mellon University takes copyright violation seriously. Besides raising awareness about copyright law, it takes appropriate action in support of enforcement as required by policy and law. United States copyright law (<http://www.copyright.gov/>) "protects the original works of authorship fixed in any tangible medium of expression, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device".

The University's Fair Use Policy (<http://www.cmu.edu/policies/administrative-and-governance/fair-use.html>) states that all members of the University must comply with US copyright law and it explains the fair use standards for using and duplicating copyrighted material. In addition, the policy prohibits the duplication of software for multiple uses, meeting the Digital Millennium Copyright Act (DMCA) (<http://www.copyright.gov/legislation/dmca.pdf>) requirements. The DMCA criminalizes the development or use of software that enables users to access material that is copyright protected. Furthermore, the Computing Policy (<http://www.cmu.edu/policies/information-technology/computing.html>) prohibits the distribution of copyright protected material via the University network or computer systems, unless the copyright owner grants permission.

The Higher Education Opportunity Act of 2008 (Public Law 110-315) Section 488, requires institutions of higher education to annually inform students that "unauthorized distribution of copyrighted material, including unauthorized peer-to-peer file sharing, may subject the students to civil and criminal liabilities". Carnegie Mellon does this by publication of a news article on Computing Services' website or via mass mail communication each semester. The law goes on to require institutions "to provide a summary of penalties for violation of Federal copyright laws, including disciplinary actions that are taken against students who engage in unauthorized distribution of copyrighted materials using the institution's information system." Copyright protected materials can include, but are not necessarily limited to:

Music

Movies or other videos

Literary works

Software

Digital images or libraries

## Cost of Attending the University

Actual tuition and fee charges can be found on the Student Financial Services' website at <https://www.cmu.edu/sfs/tuition/index.html>.

For estimated books and supplies, room and board, and personal/miscellaneous expenses view the cost of attendance for the Graduate program at <https://www.cmu.edu/sfs/tuition/graduate/index.html>.

## Descriptions of Academic Programs

Information on the university's graduate academic programs and degree offerings is available from the various schools/colleges and admitting offices. Links to those programs can be found at <https://www.cmu.edu/academics/index.html>.

## Faculty

Information on the university's faculty and instructional personnel is available from individual schools/colleges. This information can be found on the university's academics website at <https://www.cmu.edu/academics/index.html>.

## Facilities & Services for Disabled Students

The Office of Disability Resources provides responsive and reasonable accommodations to students who self-identify as having a disability, including physical, sensory, cognitive and emotional disabilities. If you would like to learn more about the services and accommodations provided by the Office of Disability Resources, visit their website at <https://www.cmu.edu/disability-resources/students/>. To discuss your accommodation needs, please email us at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) or call us at 412-268-6121 to set up an appointment.

## Student Privacy & FERPA

One of the most significant changes a parent or guardian experiences in sending a student to college is the difference in privacy standards for educational records. Carnegie Mellon values the student's right to privacy. The university adheres to a federal law called the Family Educational Rights and Privacy Act (also called FERPA or the Buckley Amendment) that sets privacy standards for student educational records and requires institutions to publish a compliance statement, including a statement of related institutional policies. For more detailed information, view the university's brochure at <https://www.cmu.edu/hub/privacy/ferpa-brochure.pdf>.

## Return to Title IV Funds Policy and Procedural Statement

### Policy Reason

The U. S. Department of Education requires that the university determine the amount of Federal Title IV aid earned by a student who withdrawals or fails to complete the period of enrollment. The university must determine the earned and unearned portions of Title IV aid as of the date the student ceased attendance based on the amount of time the student spent in attendance. Up through the 60% point in the period of enrollment, a pro rata schedule is used to determine the amount of Title IV funds the student has earned at the time of withdrawal. After the 60% point in the period of enrollment, a student has earned 100% of the Title IV funds he or she was scheduled to receive. For a student who withdraws after the 60% point-in-time, there are no unearned funds. Federal regulations can be found at:

Federal Student Aid Handbook, Volume 5

Chapter 1 Withdrawals and the Return of Title IV Funds 34 CFR 668.22

Policy and Procedural Statement

At Carnegie Mellon Title IV funds are awarded to a student under the assumption that the student will attend school for the entire period for which the assistance is awarded. When a student withdraws, the student may no longer be eligible for the full amount of Title IV funds that the student was originally scheduled to receive.

If a recipient of Title IV grant or loan funds withdraws from a school after beginning attendance, the amount of Title IV grant or loan assistance earned by the student must be determined. If the amount disbursed to the student is greater than the amount the student earned, the unearned funds must be returned. If the amount disbursed to the student is less than the amount the student earned, and for which the student is otherwise eligible, he or she is eligible to receive a Post-withdrawal disbursement of the earned aid that was not received.

Carnegie Mellon determines the Withdrawal Date and Date of Determination to complete the return calculation. A student's withdrawal date and date of determination varies depending on the type of withdrawal. When a student provides official notification to Carnegie Mellon through the Student Leave of Absence and Withdrawal Process, the withdrawal is defined as official withdrawal. When the student does not complete the Student Leave of Absence and Withdrawal Process and no official notification is provided by the student it is considered an unofficial withdrawal.

#### Leave of Absence/Withdrawal Process

A student may leave Carnegie Mellon by either taking a leave of absence (leaving the university temporarily with the firm and stated intention of returning) or by withdrawing from the university (leaving the university with no intention of returning). Students choosing to take a leave of absence should first contact their academic advisor to discuss their plans while on leave and to work out any conditions that may be necessary for a smooth return to Carnegie Mellon. A student deciding to leave the university should take the following steps:

- Complete a Leave of Absence or Withdrawal Form.
- The form must include all necessary signatures or the process will not be completed.
- Return the completed form to the University Registrar's Office, 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213.

#### Determination of Withdrawal Date

##### Official Withdrawals (Notification Provided by the Student)

Those withdrawals defined as official are processed in accordance with federal regulations. The Office of the Registrar provides information that identifies which students have processed a Student Leave of Absence and Withdrawal Form for each semester. This information includes the Date of Withdrawal, the Date of Determination, Withdrawal/Leave Status (LA, LS, & W2) and the semester of attendance. This information is maintained in the student's academic file and in the university's Student Information System.

For students who notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is the earliest of:

- Date the student began the withdrawal or leave of absence process;

- Date the student notified his or her home department;
- Date the student notified the associate dean of his or her college; or
- Date the student notified the dean of students.

#### Unofficial Withdrawal (No Official Notification Provided by the Student)

For a student who withdraws without providing notification to Carnegie Mellon, the institution determines the withdrawal date using defined criteria. This category of withdrawals includes students that drop out and students that do not earn a passing grade.

To identify the unofficial withdrawals the Registrar develops a preliminary list of students that did not complete the semester by reviewing the final student grade reports. The list includes all students with: a) semester units carried, b) 0 semester units passed, c) 0 quality points earned, and d) 0.0 QPA. The Registrar contacts the academic divisions about each student to determine if the student actually completed the semester and earned the grades (0.0) or failed to complete the semester and did not notify the University of their status.

For students who do not notify the University of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is:

- The midpoint of the semester;
- The last date the student attended an academically-related activity such as an exam, Tutorial or study group, or the last day a student turned in a class assignment.

#### Date of Determination that the Student Withdrew

Carnegie Mellon is not required to take attendance and the Date of Determination that a student withdrew varies depending upon the type of withdrawal: Official or Unofficial.

For withdrawals where the student provided *Official Notification* the Date of Determination is: The student's withdrawal date, or the date of notification, whichever is later.

For withdrawals where the student did not provide *Official Notification* the Date of Determination is: The date the institution becomes aware the student has ceased attendance.

For a student who withdraws without providing notification to the institution, the institution must determine the withdrawal date no later than 30 days after the end of the enrollment period.

#### Calculation of Earned Title IV Assistance

The withdrawal date is used to determine the point in time that the student is considered to have withdrawn so the percentage of the period of enrollment completed by the student can be determined. The percentage of Title IV aid earned is equal to the percentage of the period of enrollment completed.

The amount of Title IV federal aid earned by the student is determined on a pro-rata basis up to the end of 60% of the semester. If the student completed 30% of a term, 30% of the aid originally scheduled to be received would have been earned. Once a student has completed more than 60% of a term, all awarded aid (100%) has been earned. The percentage of federal aid earned

and the order in which the unearned aid is returned are defined by federal regulatory requirements.

The calculation of earned Title IV funds includes the following grant and loan funds if they were disbursed or could have been disbursed to the student for the period of enrollment for which the Return calculation is being performed:

- Pell Grant
- Iraq and Afghanistan Service Grant
- TEACH Grant (not available at Carnegie Mellon)
- FSEOG Grant
- Federal Direct Loan

#### Institutional Charges

Institutional charges are used to determine the portion of unearned Title IV aid that the school is responsible for returning. Carnegie Mellon ensures that all charges for tuition, fees, room and board, as well as all other applicable institutional charges are included in the return calculation. Institutional charges do not affect the amount of Title IV aid that a student earns when he or she withdraws.

The institutional charges used in the calculation usually are the charges that were initially assessed the student for the period of enrollment. Initial charges are only adjusted by those changes the institution made prior to the student's withdrawal (for example, for a change in enrollment status unrelated to the withdrawal). If, after a student withdraws, the institution changes the amount of institutional charges it is assessing a student, or decides to eliminate all institutional charges, those changes affect neither the charges nor aid earned in the calculation.

#### Return of Unearned Funds to Title IV

If the total amount of Title IV grant and/or loan assistance that was earned as of the withdrawal date is less than the amount that was disbursed to the student, the difference between the two amounts will be returned to the Title IV program(s) and no further disbursements will be made.

If a student has received excess funds, the College must return a portion of the excess equal to the lesser of the student's institutional charges multiplied by the unearned percentage of funds, or the entire amount of the excess funds.

The funds will be returned in the order below as prescribed by federal regulations, within 45 days from the date of determination that a student withdrew.

- Unsubsidized Federal Stafford Loans
- Subsidized Federal Stafford Loans
- Federal PLUS loans
- Federal Pell Grants
- Federal Supplemental Educational Opportunity Grants (FSEOG)

### Post-Withdrawal Disbursements

If the total amounts of the Title IV grant and/or loan assistance earned as of the withdrawal date is more than the amount that was disbursed to the student, the difference between the two amounts will be treated as a post-withdrawal disbursement. In the event that there are outstanding charges on the student's account, Carnegie Mellon will credit the student's account for all or part of the amount of the post-withdrawal disbursement up to the amount of the allowable charges.

Any amount of a post-withdrawal disbursement that is not credited to a student's account will be offered to the student within 30 days of the date that the institution determined that the student withdrew. Upon receipt of a timely response from the student, the College will disburse the funds within 90 days of the date of determination of the student's withdrawal date.

### Return of Title IV Funds – Withdrawals for Programs Offered in Modules

The return of Title IV funds for programs offered in modules is defined in a separate policy statement at Carnegie Mellon. This document is included as an addendum to the Carnegie Mellon University Return to Title IV Funds Policy and Procedural Statement (see below).

### Policies and Procedures

Federal Student Aid Handbook, Volume 5, Chapter 2 Withdrawals and the Return of Title IV Funds  
CFR 668.22 (a), (f) and (l)

Dear Colleague Letter GEN-11-14 July 2011

For all programs offered in modules, a student is a withdrawal for Title IV purposes if the student ceases attendance at any point prior to completing the payment period or period of enrollment (unless the institution has written confirmation from the student that they will attend a module that begins later in the enrollment period).

The regulations require the institution to determine whether Title IV funds must be returned based on the number of days actually completed versus the number of days the student was scheduled to attend in the payment period. The regulations prevent students from enrolling in modules or compressed courses spanning the period, completing a portion of the period, and retaining all aid for the period.

A program is considered to be offered in modules if a course or courses in the program do not span the entire length of the payment period or period of enrollment. The rule impacts all programs offering courses shorter than an entire semester, including semester-based programs with a summer term consisting of two consecutive summer sessions.

The Student Financial Aid Office has established the following procedures associated with handling withdrawals from programs offered in modules. An Associate Director of Student Financial Aid has the primary responsibility for compliance and implementation of these regulatory requirements.

The institution will identify students enrolled for the summer session that are eligible for Title IV Aid.

- Pell eligible students are identified
- Students with summer loans are identified
- The period of enrollment and enrollment status will be identified for each student

All Leave/ Withdrawal Forms processed by the University Registrar's Office will be reviewed for the summer sessions to record the Withdrawal Date and Date of Determination to identify any student receiving federal funding.

The Student Financial Aid Office will identify any students that drop courses in the summer sessions.

- During Summer I this is standard procedure
- During Summer II this is reviewed after 10th day reporting
- Any additional dropped courses will be reviewed through the 60% enrollment period

Students who are identified as official withdrawals or that officially drop all courses in a session will be reviewed to determine the amount of federal financial aid earned. If a Return of Title IV aid is required, existing institutional procedures will be followed.

At the end of the enrollment period the institution will determine if any students are identified as 'unofficial withdrawals.' If a Return of Title IV aid is required, existing institutional procedures will be followed.

If a student does not begin courses in all sessions, a Return of Title IV aid may not be required, but other regulatory provisions concerning recalculation may apply.

If a student completes both courses in module one, but officially drops courses in module two while attending module one the student is not a withdrawal.

Since the enrollment is less than half time, the student is no longer eligible for the loan and the funds must be returned.

The following information obtained from the Federal Student Aid Handbook, Chapter 2, Withdrawals and the Return of Title IV Funds, will be used to determine whether a student enrolled in a series of modules is a withdrawal.

#### How to determine whether a student in a program offered in modules has withdrawn

Schools can determine whether a student enrolled in a series of modules is a withdrawal by asking the following questions.

1. *After beginning attendance in the payment period or period of enrollment, did the student cease to attend or fail to begin attendance in a course he or she was scheduled to attend?*

If the answer is no, this is not a withdrawal.

If the answer is yes, go to question 2.



2. *When the student ceased to attend or failed to begin attendance in a course he or she was scheduled to attend, was the student still attending any other courses?*

If the answer is yes, this is not a withdrawal; however other regulatory provisions concerning recalculation may apply.

If the answer is no, go to question 3.

3. *Did the student confirm attendance in a course in a module beginning later in the period (for non-term and nonstandard term programs, this must be no later than 45 calendar days after the end of the module the student ceased attending)?*

If the answer is yes, this is not a withdrawal, unless the student does not return.

If the answer is no, this is a withdrawal and the Return of Title IV Funds requirements apply.

#### Contact

Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412-268-1353.

#### Satisfactory Academic Progress Policy and Procedural Statement

To be eligible for federal, state, and institutional financial aid, all students are required to maintain Satisfactory Academic Progress toward the completion of a degree. Each university determines its own policy in accordance with federal regulations set forth by the U. S. Department of Education regarding satisfactory progress standards to ensure student success. To maintain Satisfactory Academic Progress at Carnegie Mellon University, students must meet the following minimum standards for both of the qualitative (QPA) and quantitative (completion rate) measures:

Student Type	QPA (Qualitative)	Completion Rate (Quantitative)*
First Year Undergraduate	1.75	80%
Undergraduate Upper-class	2.00	80%
Heinz Graduate	3.00	80%
Other Graduate (excluding Tepper)	2.00	80%

*\*To calculate the completion rate, the cumulative number of completed units is divided by the cumulative number of units attempted. Advance Placement credits are excluded from both figures.*

In addition to the above mentioned Financial Aid Satisfactory Academic Progress standards, federal regulations require a student to complete their degree within a specified amount of time. The maximum timeframe cannot exceed 150 percent of the time published as needed for completion of the program.

#### Scope:

This policy applies to Federal aid including Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Work-Study, Federal Direct Loans, and Federal Direct PLUS Loan programs; state grant aid; and Carnegie Mellon institutional aid including grants, loans, and scholarships.

Federal regulations can be found at:

Federal Student Aid Handbook, Volume 1

Chapter 1 School Determined Requirements

34 CFR 668.16(e)

34 CFR 668.32(f)

34 CFR 668.34

#### Evaluation:

Carnegie Mellon evaluates all students for Financial Aid Satisfactory Academic Progress annually, at the end of the spring semester. Students that are included in the review are undergraduates, graduates, both full-time and part-time.

Courses that do not count toward a student's degree cannot be used to determine enrollment status for financial aid purposes. Carnegie Mellon will count transfer credit hours that are accepted toward a student's educational program as both attempted hours and completed hours. Advanced Placement Non-Degree and Non-Credit courses are not counted as units passed or attempted. When a course is repeated, all grades will be recorded on the official academic transcript and will be calculated in the student's QPA. For financial aid eligibility, only one repeat per course is permitted in the determination of enrollment status for courses previously passed.

If the student withdraws and is not assigned a W grade, then it will not be counted in the number of units attempted or completed. If the W grade is assigned, the units will be counted in the number of units attempted and will be counted as zero in the number of units completed.

If the student has incomplete units, the units will be counted as attempted and will be counted as zero in the number of units completed.

The Financial Aid Satisfactory Academic Progress evaluation is a cumulative review of all semesters, regardless of whether or not the student received financial aid during the academic year.

If the minimum requirements are not achieved, the student is ineligible to receive financial aid. In such a case, the student is notified and given an option to appeal their financial aid status. More information about the appeal process can be found at [www.cmu.edu/sfs/docs/federal-title-iv.pdf](http://www.cmu.edu/sfs/docs/federal-title-iv.pdf).

A financial aid package will not be completed unless an appeal is received, approved and processed accordingly. If by chance a financial aid package is processed and released to the student, it is conditional and subjected to financial aid removal until an appeal is received, approved and processed accordingly.

Contact:

Accountable Department: Enrollment Services, Student Financial Aid. Questions regarding this policy or its intent should be directed to the Student Financial Aid Office, phone: 412-268-1353.

### Student Body Diversity

For Information about the diversity of the university student body, contact the Institutional Research and Analysis Office, <https://www.cmu.edu/ira/index.html>.

For information about the University's Diversity, Equity and Inclusion initiative, visit the Center for Student Diversity and Inclusion's website at <https://www.cmu.edu/student-diversity/>.

### Written Arrangement Information

A U.S. Department of Education regulation requires disclosure of specific information to prospective and current students regarding written arrangements between Carnegie Mellon University (CMU) and any institution(s) that provides a portion of an educational program to students enrolled at CMU. CMU enters into such arrangements to enrich the educational experiences offered to its students. In accordance with the regulation, CMU provides this information at <http://www.cmu.edu/hub/consumer-information/docs/written-arrangement.pdf>.

### Student Complaints & Consumer Information by State

As required for compliance with U.S. Federal Program Integrity Regulations, state official/agency contact information for each U.S. state/territory that could handle a student's complaint is provided at <https://www.cmu.edu/hub/consumer-information/docs/complaints.pdf>.

### Gainful Employment Disclosures

As required by U.S. Department of Education regulations Gainful Employment Disclosures (Disclosures about CMU certificate programs that prepare students for specific occupations) can be found at <https://www.cmu.edu/hub/consumer-information/>.

Information about Student Financial Aid:

Meeting the cost of higher education is a significant investment. We are committed to providing a comprehensive financial aid program that makes it possible for admitted students to attend Carnegie Mellon.

### Application Process & Timeline:

Graduate Students: **To apply for financial aid for the 2019-2020 academic year, follow the steps below.**

Free Application for Federal Student Aid (FAFSA)

The FAFSA is required if applying for federal financial aid programs. There are now two ways to complete the *Free Application for Federal Student Aid (FAFSA)* form: a redesigned <https://studentaid.ed.gov/sa/fafsa> website or a mobile app (available through Google Play, <https://play.google.com/store/apps/details?id=com.fsa.mystudentaid> or the Apple App Store, <https://itunes.apple.com/us/app/mystudentaid/id1414539145>).

We recommend using the IRS Data Retrieval Tool (DRT) (<https://studentaid.ed.gov/sa/resources/irs-drt-text>) to complete the FAFSA. The DRT transfer process has been improved to include stronger security and privacy protections; therefore, tax information transferred will not display on the form or Student Aid Report. Instead, the phrase "Transferred from the IRS" will appear in the fields.

Those selected for federal verification after FAFSA completion or those unable to use the IRS DRT will need to request an IRS Tax Return Transcript (<https://www.irs.gov/individuals/get-transcript>).

Additional information:

Apply as soon as possible after October 1.

Carnegie Mellon's federal code is 003242.

Use 2018 tax information to complete the FAFSA.

A Department of Education Federal Student Aid (FSA) ID is required. View FSA ID instructions at <https://fsaid.ed.gov/npas/index.htm>.

Students must complete the FAFSA's electronic signature requirement.

#### MPN & Entrance Counseling

All first-time Federal Direct Loan borrowers are required to complete entrance counseling. The entrance counseling session provides information about borrower rights and responsibilities. CMU will be notified when a student has completed online entrance counseling. Funds will not be disbursed until the entrance counseling session has been completed. Students who completed a federal entrance counseling session while at CMU, do not have to complete another session.

Additional information:

View entrance counseling instructions (<https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/mpn-entrance-counseling.html>).

Complete entrance counseling session at <https://studentloans.gov>.

#### Grad PLUS Loan

If you plan on borrowing a Federal Direct Graduate PLUS Loan, this is a two-part process and both parts must be completed in order for your loan to be originated. If you borrowed a Grad PLUS Loan last academic year, you are only required to complete the application portion of the process. The application portion of the process cannot be completed before June 1, 2019.

Additional information:

View detailed Grad PLUS Loan instructions at <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/plus/instructions.html>.

The two-part process may be completed at <https://studentloans.gov>.

### Financial Aid Eligibility Notification

Once a student completes all of the steps above, a financial aid package will be determined. The Student Financial Aid Office will notify the student by email that a financial aid award letter has been posted to SIO (<https://s3.andrew.cmu.edu/sio/index.html#finances-home>). The letter contains information and further instructions regarding the student's eligibility and awards. If a student's circumstances change, then financial aid eligibility will be re-evaluated and the student will receive notification that a revised award letter is available in SIO.

### Missing Documents

If we are unable to process a student's financial aid package due to missing documents, a Financial Aid Alert email will be sent to the student requesting the required documents by a specified date. Until the entire application process is completed and all required documents are submitted, our office may be unable to complete a student's financial aid package. Students may log in to SIO (<https://s3.andrew.cmu.edu/sio/index.html#finances-home>) to view documents that have been received by our office. [View instructions](#) for submitting missing documents at <https://www.cmu.edu/sfs/financial-aid/missing-documents/index.html>.

### Teacher Certification

Teacher certification students at the graduate level should be aware that federal regulations classify them as a grade level 5 undergraduate student for Federal Direct Student Loan purposes. Teacher certification students are, however, considered a graduate student by Carnegie Mellon for academic purposes.

### Available Financial Aid

#### Scholarships & Grants

##### Graduate Students:

Graduate students interested in scholarships and grants may contact their program of interest or department. View more information on the Graduate Education Office website, <http://www.cmu.edu/graduate/prospective-students/index.html>. In addition, the Fellowships & Scholarships Office (<http://www.cmu.edu/fso/>) provides support to graduate students interesting in pursuing certain external scholarships, like Fulbright and UK Awards.

### Federal Work-Study

Federal Work-Study (FWS) is a need-based self-help award. If a student has been awarded FWS, the FWS award is the total that can be earned during the academic year as a work-study student.

### Federal Loans

For many students and families, educational loans are a necessary part of the process of paying for college. Student Financial Aid certifies loans for students, as well as Federal Direct Parent PLUS Loans for parents of undergraduates and Federal Direct Grad PLUS Loans for graduate students.

### Federal Direct Student Loan

The Federal Direct Student Loan is the most widely-used loan for college students and is available to both undergraduate and graduate students. There are two types of Federal Direct Student Loans, subsidized and unsubsidized, and eligibility for both is determined by completing the FAFSA.

### Grad PLUS Loan

Eligible graduate students may borrow a Federal Direct Grad PLUS Loan to assist with educational expenses. Students may borrow any amount up to their calculated cost of attendance minus any other aid received.

### Private Loans

Private loan programs offer competitive interest rates and borrower benefits. To increase chances of approval and possibly improve the rate you receive, students are strongly recommended to apply with a creditworthy co-signer.

### Student Outcomes

#### Retention and Graduation Rates

Institutional Research and Analysis Office offers up-to-date data on degrees conferred, enrollment reports, freshmen retention rates and race and ethnicity reports for annual degrees. Retention and Graduation rates can be found at <https://www.cmu.edu/ira/retentiongradrates.html>.

#### Intercollegiate Athletic Program Participation Rates and Financial Support Data (Equity in Athletics Disclosure Act)

Please visit the U.S. Department of Education's site, The Equity in Athletics Data Analysis (<http://ope.ed.gov/athletics/#/>) and select the "Get data for one schools" option. Enter "Carnegie Mellon University" in the "Name" field and select the "Continue" button at the bottom of the page.

A printed copy of the report can be requested by calling the Department of Athletics, Physical Education, and Recreation at 412-268-8054 or by sending an email to Josh Centor, Associate Vice President for Student Affairs and Director of Athletics, Physical Education & Recreation, at [jcentor@andrew.cmu.edu](mailto:jcentor@andrew.cmu.edu).

### Health and Safety

#### Drug and Alcohol Abuse Prevention Program

Under the Drug Free Workplace Act of 1988 and the Drug Free Schools and Campuses Act of 1989, the Carnegie Mellon University is required to have an alcohol and other drug policy outlining prevention, education and intervention efforts and consequences for policy violations. The policy can be found at <https://www.cmu.edu/policies/administrative-and-governance/alcohol-and-drug-policy.html>.

#### CMU Annual Security and Fire Safety Report

A printed copy of the report can be requested by contacting University Police at 412-268-6232 or [campuspd@andrew.cmu.edu](mailto:campuspd@andrew.cmu.edu).

The annual security and fire safety report (Carnegie Mellon University Police Department Annual Reports) is also available online at <http://www.cmu.edu/police/security-fire-reports/index.html>.

### Vaccination Policies

CMU Prematriculation Immunization Policy can be found at <http://www.cmu.edu/policies/student-and-student-life/immunizations.html>.

CMU University Health Services Health Requirements for Incoming Students can be found at <https://www.cmu.edu/health-services/new-students/>.

### Other Information

#### Voter Registration

Please visit <http://www.usa.gov/Citizen/Topics/Voting/Register.shtml>.

#### Carnegie Mellon Ethics Hotline

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity relating to financial matters, academic and student life, human relations, health and campus safety or research.

Students, faculty and staff can anonymously file a report by calling 877-700-7050 or visiting [www.reportit.net](http://www.reportit.net) (user name: tartans; password: plaid). All submissions will be reported to appropriate university personnel.

*The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.*

#### Statement of Assurance

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the vice president for campus affairs, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.



5000 Forbes Avenue

Pittsburgh, PA 15213

[www.ece.cmu.edu](http://www.ece.cmu.edu)

@CMU\_ECE



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Electrical & Computer Engineering

**2024-2025 Ph.D. Catalog/Handbook**

ECE Office of Academic Affairs

This document is for the internal use of the Department of Electrical and Computer Engineering at Carnegie Mellon University only and may not be distributed or reproduced for external distribution in any form without express written permission of the Department Head of the Department of Electrical and Computer Engineering. This handbook is posted to the [ECE Ph.D. webpage](#) prior to the start of each academic year and is updated as needed. This handbook is effective August 1, 2022 through July 31, 2023.

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Pittsburgh, PA 15213-3890  
(412) 268-2000  
[www.cmu.edu](http://www.cmu.edu)

Carnegie Mellon University – Silicon Valley  
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Moffett Field, CA 94035-0001  
(650) 603-7032  
[www.cmu.edu/silicon-valley](http://www.cmu.edu/silicon-valley)

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## 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 8<sup>th</sup> and 5<sup>th</sup> 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 and your CIT graduate student handbook are specific to your academic experience in the department, there are several other resources and offices graduate students are encouraged to consult during their tenure at Carnegie Mellon University. Information about The Word, the student handbook, the Office of Graduate and Postdoc Affairs, the Office of the Dean of Student Affairs and others are included in Appendix A of this handbook.

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

Sincerely,

A handwritten signature in blue ink that reads "Larry Pileggi". The signature is fluid and cursive, with a period at the end.

Larry Pileggi  
Tanoto Professor and Department Head  
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 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.

## Vision

Carnegie Mellon University will have a transformative impact on society through continual innovation in education, research, creativity, and entrepreneurship.

## Mission

To create a transformative educational experience for students focused on deep disciplinary knowledge; problem solving; leadership, communication, and interpersonal skills; and personal health and well-being.

To cultivate a transformative university community committed to (a) attracting and retaining diverse, world-class talent; (b) creating a collaborative environment open to the free exchange of ideas, where research, creativity, innovation, and entrepreneurship can flourish; and (c) ensuring individuals can achieve their full potential.

To impact society in a transformative way — regionally, nationally, and globally — by engaging with partners outside the traditional borders of the university campus.

## INTRODUCTION

### Graduate Degrees and Programs Offered

Master of Science in Electrical and Computer Engineering

- Pittsburgh
- Silicon Valley
- Africa

Master of Science in Software Engineering

- Silicon Valley

Doctor of Philosophy in Electrical and Computer Engineering

- Pittsburgh
- Silicon Valley
- Portugal

Please note: The instruction for all degrees and programs will occur in English.

### 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 Silicon Valley.

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 Graduate Affairs Office.

## CARNEGIE MELLON POLICIES, EXPECTATIONS, STATEMENT OF ASSURANCE, AND CODE

### Carnegie Mellon Policies & Expectations

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this departmental graduate student catalog the following resources are available to assist you in understanding community expectations:

- [The Word/Student Catalog](#)
- [Academic Integrity Website](#)
- [University Policies Website](#)
- [Graduate Education Website](#)
- [College of Engineering Website](#)

- Please see [Appendix A](#) for additional information about The Word and University resources.

## Carnegie Mellon Statement of Assurance

Carnegie Mellon University does not discriminate in admission, employment or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the university ombudsman, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-1018. Obtain general information about Carnegie Mellon University by calling 412-268-2000.

Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault and fire safety policies, and containing statistics about the number and type of crimes committed on the campus, and the number and cause of fires in campus residence facilities during the preceding three years. You can obtain a copy by contacting the Carnegie Mellon Police Department at 412-268-2323. The annual security and fire safety report also is available online at [www.cmu.edu/police/annualreports](http://www.cmu.edu/police/annualreports).

Information regarding the application of Title IX, including to admission and employment decisions, the sexual misconduct grievance procedures and process, including how to file a report or a complaint of sex discrimination, how to file a report of sexual harassment, and how the university responds to such reports is available at [www.cmu.edu/title-ix](http://www.cmu.edu/title-ix). The Title IX coordinator may be reached at 5000 Forbes Ave., 140 Cyert Hall, Pittsburgh, PA 15213; 412-268-7125; or [tix@cmu.edu](mailto:tix@cmu.edu).

Due to the changing nature of conditions and expectations surrounding public health and safety requirements please visit [www.cmu.edu/coronavirus/for](http://www.cmu.edu/coronavirus/for) the most up to date information.

## Carnegie Mellon Code

Students at Carnegie Mellon, because they are members of an academic community dedicated to the achievement of excellence, are expected to meet the highest standards of personal, ethical, and moral conduct possible.

These standards require personal integrity, a commitment to honesty without compromise, as well as truth without equivocation and a willingness to place the good of the community above the good of the self. Obligations once undertaken must be met and commitments kept.

As members of the Carnegie Mellon community, individuals are expected to uphold the standards of the community in addition to holding others accountable for said standards. It is rare that the life of a student in an academic community can be so private that it will not affect the community as a whole or that the above standards do not apply.

The discovery, advancement, and communication of knowledge are not possible without a commitment to these standards. Creativity cannot exist without acknowledgment of the

creativity of others. New knowledge cannot be developed without credit for prior knowledge. Without the ability to trust that these principles will be observed, an academic community cannot exist.

The commitment of its faculty, staff, and students to these standards contributes to the high respect in which the Carnegie Mellon degree is held. Students must not destroy that respect by their failure to meet these standards. Students who cannot meet them should voluntarily withdraw from the university.

The Carnegie Mellon Code can also be found on-line at <https://www.cmu.edu/student-affairs/theword/>.

## Carnegie Mellon Child Protection Requirements

Carnegie Mellon is committed to providing a safe and secure environment for all minors involved in any programs or activities conducted on university premises, as well as any off-campus programs or activities sponsored by the university. Details are available through the Leonard Gelfand Center [Child Protection Operations](#).

If you have questions regarding Act 153 or encounter a situation when you would need to have appropriate clearances, please contact Tara Moe at [taramoe@ece.cmu.edu](mailto:taramoe@ece.cmu.edu).

## DEPARTMENTAL INFORMATION

### University Personnel

Throughout your time in the M.S. program, you will encounter a variety of faculty and staff who will help you on your way to completing your degree. You may view a list of faculty (<https://www.ece.cmu.edu/directory/faculty.html>) and a list of staff (<https://www.ece.cmu.edu/directory/staff.html>) affiliated with ECE online. Below is a list of faculty and staff whom you are likely to encounter during your time in the M.S. program.

- Dean of the College of Engineering: [Professor William Sanders](#)
- Associate Dean of Graduate and Faculty Affairs: [Professor Shelley Anna](#)
- 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](#)
- Student Organizations Advisor in Silicon Valley: [Brittany Bristoll](#)
- Ph.D./M.S. Academic Program Advisor in Silicon Valley: [Brittany Bristoll](#)
- PhD Senior Academic Program Advisor (Pittsburgh): [Greta Ruperto](#)

A general list of contacts (<https://www.ece.cmu.edu/about/contact.html>) can also be found on the ECE website.

## University Resources

### Stellic Degree Audit

Each student has access to [Stellic Degree Audit Application](#) which includes degree planning tools can show how courses taken or registered for meet the degree requirements. Students should also meet with their academic advisor to review how their courses have been applied to the degree requirements.

### University Resource Websites

Several pertinent university policies are included in this handbook, primarily found in the [University Policies section](#). The complete university policies are available online at the following link: <http://www.cmu.edu/policies>.

Additional assistance is available in understanding community expectations, with the following resources being particularly relevant to ECE students:

- The Office of the Assistant Vice Provost for Graduate Education. Website: [www.cmu.edu/graduate](http://www.cmu.edu/graduate). Email: [grad-ed@cmu.edu](mailto:grad-ed@cmu.edu)
- The Office of the Dean of Student Affairs. Website: [www.cmu.edu/student-affairs/index.html](http://www.cmu.edu/student-affairs/index.html)
- Student Services in Silicon Valley. Website: <http://sv.cmu.edu/student-services/index.html>.
- Assistance for Individuals with Disabilities. Contact Larry Powell, Equal Opportunity Services, 412-268-2013, [lpowell@andrew.cmu.edu](mailto:lpowell@andrew.cmu.edu)
- Eberly Center for Teaching Excellence. Website: [www.cmu.edu/teaching](http://www.cmu.edu/teaching)
- Graduate Student Assembly. Website: <http://www.cmu.edu/stugov/gsa/index.html>
- Intercultural Communication Center. Website: [www.cmu.edu/icc](http://www.cmu.edu/icc)
- Office of International Education. Website: <https://www.cmu.edu/oie/>
- Counseling & Psychological Service (CaPS). Website: <https://www.cmu.edu/counseling/>
- University Health Services. Website: [www.cmu.edu/HealthServices](http://www.cmu.edu/HealthServices)
- University Police. Website: [www.cmu.edu/police](http://www.cmu.edu/police)
- The Word (student online handbook). Website: <http://www.cmu.edu/student-affairs/theword>
- Academic Integrity Website: <https://www.cmu.edu/student-affairs/ocsi/academic-integrity/index.html>
- University Policies Website: [www.cmu.edu/policies/](http://www.cmu.edu/policies/)

Please refer to [Appendix A](#) for additional information about each of the above-cited resources.

### University Library

#### Pittsburgh campus

Students in Pittsburgh have access to several on-campus libraries. More information about the libraries can be found on the CMU Library website: <https://www.library.cmu.edu>

## Silicon Valley campus

Library and Resources CMU-SV does not operate a library on campus, but we do have specialized library resources available for students, faculty, and staff. Resources include:

1. Interlibrary Loan
2. e-book developments
3. University Libraries Quick Links

Through the Interlibrary loan, students can request books, articles from journals and conferences, technical reports, or other materials to be sent to you. The materials may be from Carnegie Mellon libraries in the U.S. or other institutions worldwide. Electronic delivery for many articles is available. ILLiad is the system that our students use to request these items. What ILLiad can be used for:

- To request to borrow a book, a tech report, a thesis, copy of an article, etc.
- Check status of requests
- Edit requests
- Cancel requests
- Update your contact information or delivery preferences
- Request to renew an interlibrary loan

The ILLiad link can be found at <https://illiad.library.cmu.edu/illiad/illiad.dll>.

The first time you use the link you need to provide information about yourself. You only need to do this once. When completing the form, choose these options:

- For Mailing Address, state: Silicon Valley campus
- For Delivery Location, state: E&S Library

E-book developments can be found on our website at <http://guides.library.cmu.edu/svc>.

Since we have students, staff, and faculty in Pittsburgh, Qatar, Africa, and Silicon Valley, we're making a concerted effort to collect whatever e-Books we can so that all of our community can use them. You'll find them in CAMEO - our online catalog.

University Quick Links can also be found on the website at <http://guides.library.cmu.edu/svc>.

For additional questions regarding library resources, please contact Matt Marsteller, Head, CMU Science Libraries at [matthewm@andrew.cmu.edu](mailto:matthewm@andrew.cmu.edu) or by phone: 412-268-7212

## Department Resources

### Course Instructors

ECE courses are taught by world-renown educators and researchers.

#### Hakan Erdogmus, Teaching Professor

Ph.D., Telecommunications, Université du Québec

#### Cecile Peraire, Associate Teaching Professor

Ph.D., Computer Science, Swiss Federal Institute of Technology

#### John Shen, Professor

Ph.D., Electrical Engineering, University of Southern California

#### Leonardo da Silva Souza, Assistant Teaching Professor

Ph.D., Computer Science, Pontifícia Universidade Católica do Rio de Janeiro

#### Rafal Wlodarski, Assistant Teaching Professor

Ph.D., Lodz University of Technology

### 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 and Brittany Bristoll serve as the academic advisors for Ph.D. students.

Academic advising is done through the Graduate Affairs Office. In Pittsburgh this is in Hamerschlag Hall 1113; in Silicon Valley this is in B23 123. The Ph.D. Academic Program Advisor administratively advises all ECE Ph.D. students throughout the entire duration of the Ph.D. program. While this advisor does not provide content-specific expertise in ECE, he/she helps students navigate through 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. Nathan Snizaski and Brittany Bristoll are the Academic Advisors for Ph.D. students.

Nathan can be reached by email: [nathanedward@cmu.edu](mailto:nathanedward@cmu.edu), by phone: (412) 268-3200, or in person in 1113 Hamerschlag Hall. To guarantee availability, you are encouraged to schedule an appointment with him by accessing his [calendar](#) in the signature block of his e-mail. Nathan advises Pittsburgh based Ph.D. and Portugal based students.

Brittany can be reached by email: [bjreyes@andrew.cmu.edu](mailto:bjreyes@andrew.cmu.edu), or by phone: (650) 603-0934. To guarantee availability, you are encouraged to schedule an appointment with her by accessing her [calendar](#) in the signature block of her e-mail. Brittany advises all Silicon Valley based Ph.D. students.

### 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.

## *Faculty Credentials*

For all faculty please visit the ECE [faculty directory](#).

Faculty based in Silicon Valley and teaching in Silicon Valley:

**Anupam Datta, Professor**

Ph.D., Computer Science, Stanford University

**Hakan Erdogmus, Teaching Professor**

Ph.D., Telecommunications, Université du Québec

**Manish Pandey, Adjunct Instructor/Professor**

Ph.D., Computer Science, Carnegie Mellon University

**Cecile Peraire, Associate Teaching Professor**

Ph.D., Computer Science, Swiss Federal Institute of Technology

**John Shen, Professor**

Ph.D., Electrical Engineering, University of Southern California

**Patrick Tague, Associate Research Professor**

Ph.D., Electrical Engineering, University of Washington

**Leonardo da Silva Souza, Assistant Teaching Professor**

Ph.D., Computer Science, Pontifícia Universidade Católica do Rio de Janeiro

**Pei Zhang, Associate Research Professor**

Ph.D., Computer Engineering, Princeton University

Faculty based in Pittsburgh and broadcasting courses to Silicon Valley:

**Lujo Bauer, Associate Professor**

Ph.D., Computer Science, Princeton University

**Franz Franchetti, Professor**

Ph.D., Computational Mathematics, Vienna University of Technology

**Saugata Ghose, Special Faculty Systems Scientist**

Ph.D., Computer Systems, Cornell University

**Virgil Gligor, Professor**

Ph.D., Electrical Engineering and Computer Science, University of California at Berkeley



**Limin Jia, Associate Research Professor**  
Ph.D., Computer Science, Princeton University

**Diana Marculescu, Professor**  
Ph.D., Computer Engineering, University of Southern California

**Bill Nace, Teaching Professor**  
Ph.D., Electrical and Computer Engineering, Carnegie Mellon University

**Aswin Sankarayananan, Associate Professor**  
Ph.D., Electrical and Computer Engineering, University of Maryland

**Vyas Sekar, Associate Professor**  
Ph.D., Computer Science, Carnegie Mellon University

**Osman Yagan, Associate Research Professor**  
Ph.D., Electrical and Computer Engineering, University of Maryland

## *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
<b>CMU   Portugal Dual Degree Program</b>	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.
<b>Silicon Valley</b>	Silicon Valley students are generally directly matched with the faculty advisor listed on the admission letter. Silicon Valley students will still be expected to formalize this relationship by filling out the matching process survey.

*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 Graduate 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 his/her 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 will hold 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 Graduate 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 2021-2022 academic year is Professor L.R. Carley. The dates for the GSC meetings will be posted on the [GSC Petitions Procedures website](#) (requires Andrew ID log in) before the start of each semester.

## Bulletin Boards

Silicon Valley campus

- Students in Silicon Valley can find bulletin boards located in Buildings 23. Bulletin boards will be cleared on a regular basis.

## Tech & Receiving

Silicon Valley campus

- Students on the Silicon Valley campus should work with their instructor if supplies are needed.

## Computer Clusters

There are not computer clusters available in Silicon Valley.

## Printers

**Printers** are provided for student academic use.

Silicon Valley campus

- Printers are for use in Building 23 (B23) Room 123 and the hallway in B23 outside of 109/110. Instructions for adding printers and policies are posted next to each printer.

## Keys

Silicon Valley campus – you must use your CMU ID to enter building 23 every time.

## Lab & Office Space

Lab and office space for both campuses 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

Silicon Valley campus

- There are several spaces for students in Silicon Valley to use. The main student lounges can be found in B23, downstairs Room 129 and upstairs Room 227.

## Department Office/Building Security, Repairs and Services

### Silicon Valley campus

- Any damages, repairs, or security concerns should be reported to Stacy Marshall, Facilities and Events Manager, by emailing [facilities@sv.cmu.edu](mailto:facilities@sv.cmu.edu). In an emergency, please contact NASA Police at 650-604-5555.

### General Silicon Valley campus facilities description

The Silicon Valley campus is located in the historic Shenandoah Plaza on the NASA Ames Research Park. We occupy one building, building 23. Building 23 is a 20,111 sq. ft. two-story historic building and is our main administrative and teaching building. It largely houses our academic space: 5 classrooms, 31 faculty and staff offices, 6 conference rooms, 2 kitchen/break rooms, 1 cafe lounge, and 1 multi-function lounge & event space. Located in the annex of Building 23 is the Carnegie Mellon Innovations Lab (CMIL), a 1,247 sq. ft. multi-use student lounge.

### Local Housing

The CMU campus in Silicon Valley does not offer on-campus housing or off-campus housing services. Students need to find their own housing. There are many apartment complexes and/or room rentals within a commutable distance from the campus. Housing costs vary and most students choose to have roommates. [View a range of housing prices in the Mountain View area.](#)

While our student affairs office cannot act as a real estate agency or rental broker for you, we are happy to offer our advice or suggestions on locations that may be of interest to you. For questions, please contact the Assistant Dean of Student Affairs at [student-services@sv.cmu.edu](mailto:student-services@sv.cmu.edu).

### Graduate Student Organizations

- **EGO (ECE Graduate Student Organization)** organizes academic and social events throughout the academic year.

For more information on graduate student organizations and opportunities for future involvement in the ECE department, please contact Brittany Bristoll.

### Press & Media Relations

ECE's Assistant Director of Communications is the point-of-contact between news media and the ECE, including faculty, students, and staff.

If any student, staff or faculty member of ECE is contacted by a media representative, they are required to immediately inform either the Communication Manager and/or the Director of Operations. Members of the ECE community are not required to answer any questions from the media without first seeking information from ECE's Communication Manager and/or the Director of Operations.

Persons interested in publicizing a program, project, event, or other activity affiliated within ECE should contact the Communications Manager **Krista Burns** who can provide guidance on internal and external communications.

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.

## PRE-MATRICULATION

### Admissions Policies

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

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

### TOEFL Requirements and Language Proficiency

Admission to Carnegie Mellon University graduate programs requires demonstration of completed, relevant undergraduate degree programs, as demonstrated by an original transcript from the degree-granting institution during the admission process. Domestic students who graduate from an accredited college or university in the US have demonstrated their English language facility and skill by their success and graduation from competitive undergraduate US institutions.

The TOEFL test is required of all international applicants whose native language is not English. Native language is defined as first language, or language spoken from birth. The TOEFL is not required if the applicant has graduated from a U.S. university, or if the applicant is a CMU student or alum.

The Admissions Committee prefers the TOEFL to the IELTS. While you are encouraged to take the TOEFL, if you are unable to do so, we look for a minimum overall score of 7 on the IELTS, with minimum sub-scores of Reading-6.5, Listening-6.5, Speaking-6, and Writing-6.

Nonnative English speakers may utilize the Intercultural Communication Center (ICC) for language support: <https://www.cmu.edu/icc/>. The Silicon Valley campus also has a Communications and Language Services Office for additional language support for nonnative English speakers: <http://sv.cmu.edu/student-services/communication-language-services.html>

### 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/index.html>) 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://www.cmu.edu/research-compliance/responsible-conduct/training.html>

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). This requirement may be waived for part-time students via a petition to the Department Head and the Associate Dean for Graduate and Faculty Affairs.

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 and Part-time Requirements section](#) 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. 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 his/her advisor in writing and, if required by the terms of the student's support package, must make up the work. 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
- Independence Day
- Labor Day
- Thanksgiving Day
- Day After Thanksgiving
- Day Before Christmas
- Christmas Day
- Day Before New Year's Day

## Early Completion

Graduate students who consider the completion of all degree requirements in less than the standard length of time for their program of study may consult with their degree-granting program or department to determine if early degree certification is allowed and under what circumstances.



## Extended or Longer-than-Standard Completion

Longer-than-standard degree completion may occur due to academic interruptions in making progress toward the degree as defined by the academic program, interruptions of full-time study or progress towards the degree due to serious, documented medical issues, or other unusual or unforeseen circumstances.

Doctoral students who require an extended period to complete their degree requirements must consult with their academic program, and are subject to the CMU Policy on Doctoral Student Status ([www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html](http://www.cmu.edu/policies/student-and-student-life/doctoral-student-status.html)), specifically the “Time to Degree” section.

## *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.

## *Part-time Requirements*

Occasionally, employment constraints may result in a student being enrolled part-time (less than 36 units per semester) in the Ph.D. program while they continue to work full-time elsewhere. Students planning to enroll in the Ph.D. part-time should discuss their part-time status with their faculty advisor and academic advisor and create a plan that will ensure their timely and comprehensive fulfillment of the Ph.D. program. Part-time students should note that the Ph.D. program is rigorous and that students should think carefully about embarking upon a part-time program while continuing to work full-time.

Part-time students are subject to [CIT's residency requirement](#) (see ‘Part-Time graduate programs’ section) and requires that student spend at least one academic year (fall and spring) on campus over the course of the Ph.D. program. Any deviation from this requirement must be petitioned for by the student and his advisor prior to his or her enrollment in the Ph.D. program. The petition must be approved by the Department Head and the Associate Dean for Graduate and Faculty Affairs.

Part-time students should be enrolled for less than 36 units each fall and spring semester. Most part-time students take 12 or 24 units per semester.

## Statute of Limitations

ECE adheres to [CIT's policy on Ph.D. 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." Former ECE students who did not

fulfill graduation requirements and would like to return to complete a degree should refer to the [statute of limitations](#) in CIT’s graduate student policies for more information.

Under extraordinary circumstances, such as leave of absence, military or public service, family or parental leave, or temporary disability, a school or college may, upon the relevant department’s recommendation and with the written approval of the dean, defer the lapse of All But Dissertation status for a period commensurate with the duration of that interruption. Students, who are pursuing the Ph.D. degree as part-time students for all semesters of their program, as approved by their program, may also appeal to their program or department for extension of the time to degree limit. Requests for extensions to the statute of limitations must be submitted to the Graduate Studies Committee at least one semester prior to the statute of limitations expiration.

Students wishing to obtain an extension due to special circumstances must to submit a formal petition at least one semester prior to his or her defense timeline expiring. The time clock will stop for students who have not taken the qualifying exam prior to the leave of absence.

### 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 online poll disseminated by the Graduate Affairs Office. 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 on 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 table below:

<b>Program</b>	<b>Location Details</b>
<b>CMU   Portugal Dual Degree Program</b>	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.
<b>Silicon Valley</b>	Students and their faculty advisors should work together to determine where the student will be physically located each semester.

Once students have reported their location to the Graduate Affairs Office, any change in plans should be communicated immediately and directly to the Graduate Affairs Office. It is the responsibility of the student and his or her advisor to communicate location information to the Graduate 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. Ph.D. students have two M.S. options: a course M.S. or a project M.S.

#### *Course M.S.*

The **course M.S.** requires 96 units of coursework, 12 units of which can be research. Of the 96 units, 60 units are restricted (including 12 units of research) and 36 are less-restricted.

#### *Project M.S.*

The **project M.S.** is only open to ECE Ph.D. students. This option also requires 96 units of coursework, 36 units of which can be research in exchange for writing a 40 page or less research paper. 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. Twelve of the 36 units will be allocated to the restricted 60 units, and 24 of the 36 units will be allocated to the less-restricted units.

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 done 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 10<sup>th</sup> 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 Graduate 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 Graduate 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:

1. Register for the course in SIO.
2. Obtain permission from the instructor and ask the instructor to sign the [course audit approval form](#).
3. Submit the form to their academic advisor for approval.
4. 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 are permitted to take courses pass/no pass in consultation with their faculty advisor. Students interested in taking a course pass/no pass should register for the course, then complete the [Pass/No Pass Approval form](#). The form should be signed by the academic advisor. Courses taken pass/no pass cannot count towards the course or breadth requirements for the ECE Ph.D.

Once a Pass/Fail 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. 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; work with a grade at or lower than 'D+' 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 will not be able to request the option to pass/fail a course.

Any student may take a course pass/fail. For billing, the pass/fail course is considered the same as the traditional courses under the tuition charges. If a part-time student takes a course pass/fail, he/she will be charged part-time tuition based on the per-unit tuition rate for the course.

### Petition Process

Petitions are approved by the GSC. 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.

The petitions process is as follows:

1. Student completes the appropriate [petition form](#) and submits it to their academic advisor in the Graduate Affairs Office no later than 5pm ET on the Friday before the GSC meeting.
2. The academic advisor presents the petition to the GSC.
3. Students are notified of the outcome of their petition via an email from the M.S. Academic Advisor after the GSC has met. Generally, all GSC decisions are final.
4. Due to time constraints, some petitions may be tabled until the following GSC meeting. When this occurs, students will be notified via email.

5. 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 M.S. 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. Courses can only be requested for transfer after the student has successfully completed 36 units of coursework at Carnegie Mellon. 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:

1. Meet with academic advisor and faculty advisor to discuss the course transfer
2. Complete and collect the following mandatory documents:
  - a. [Petition for Graduate Studies Committee approval](#)
  - b. Official transcript from previous institution
  - c. Detailed course description/syllabus (should include grading scale, assignments required, mandatory books, and time required in class) of the course you wish to transfer
  - d. Letter from the previous institution's registrar or academic advisor stating the course intended for transfer was not used towards a degree
  - e. E-mail endorsement from the instructor of the CMU course you believe your transfer course is most equivalent to
  - f. [CIT Graduate Transfer Credit Request form](#)
3. Submit the completed packet to the academic advisor

4. The academic advisor will present the transfer request to the CIT Dean’s office and notify the student of the result.
5. Once the petition is approved, the Graduate Affairs Office will work with the student to complete the transfer request.

ECE has not entered into an articulation or transfer agreement with any specific college or university. The transfer of credits from any college or university must follow the above policy and process. Additionally, ECE does not award credit for prior experiential learning.

#### Pittsburgh Council on Higher Education (PCHE) Cross-Registration Program

Full-time Carnegie Mellon students may take subjects for credit through the Pittsburgh Council on Higher Education (PCHE). The purpose is to provide opportunities for enriched educational programs by permitting *full-time* paying undergraduate and graduate students to cross-register for **one** course at any of the ten PCHE institutions. Please refer to [The HUB website](#) for additional details.

### Registering for Courses

#### Academic Calendar

ECE adheres to the official CMU [Academic Calendar](#). The [Heinz College](#) and the [Tepper School](#) follow their own calendars with dates that may differ from the University’s calendar for the 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.

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

Program	Registration Details
<b>CMU   Portugal Dual Degree Program</b>	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 in located in Portugal or Pittsburgh.
<b>Silicon Valley</b>	Silicon Valley students should register for at least 37 units in their first semester and 36 units each semester thereafter whether they are in Silicon Valley 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 a site outside the SIO. Tepper will publish a list of available MBA courses, and in order to register for Tepper courses, students should visit the [Tepper registration site](#).

### 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 their academic advisor and faculty advisor to discuss the withdrawal. Withdrawals take place after the drop deadline but before the last day of the semester. 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 should send an email to Academic Services Manager, Megan Oliver at [mvoliver@andrew.cmu.edu](mailto:mvoliver@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.

### Technology Enhanced Courses

The ECE department 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". Other 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 (Pittsburgh, Silicon Valley) may take a maximum of one online course per semester that does not have a required in-person component, per F1 regulations.

### Courses with Time Conflicts

Students are not permitted to register for two courses that conflict in time. Registration may be possible with consent from an instructor, allowing the conflict or attendance at an alternate time. Students should forward permissions from instructors to their academic advisor in order to register for conflicting courses.

### 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 18-600/15-213/15-513/18-213 as a prerequisite, students will not be permitted to enroll in the subsequent course without credit for 18-600/15-513. 18-600 and 15-513 are the only courses available to graduate students that satisfy the prerequisite requirement. Students attending Pittsburgh campus can plan to take 15-513 in the summer prior to their matriculation in the fall semester. Tuition will apply at a **per unit rate**.

Graduate courses that require 18-600/15-213/15-513/18-213 anywhere in their prerequisite tree include:

- 18-640 – Foundations of Computer Architecture
- 18-648 – Embedded Real-Time Systems
- 18-649 – Distributed Embedded Systems

- 18-656 – Data Intensive Workflow Development for Software Engineers
- 18-725 – Advanced Digital Integrated Circuit Design
- 18-740 – Computer Architecture
- 18-742 – Parallel Computer Architecture
- 18-745 – Rapid Prototyping of Computer Systems
- 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
- 18-848 – Special Topics in Embedded Systems

## Ph.D. Program Course List

See Appendix C.

## 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, he or she must discuss the issue with the course instructor. 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.

## 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 Graduate 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.

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 his or her faculty advisor 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.

Per [university policy on student leaves](#), "Students on leave are not permitted to live in university housing, attend classes or maintain employment as students at Carnegie Mellon while their leave is in effect."

More information about the University's [Leave of Absence and Withdrawal](#) policies can be found in the [University Policies](#) section of this handbook.

### 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 Graduate 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 Graduate Affairs Office.

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

## ACADEMIC STANDARDS

### Grades

Below are the policies surrounding grades for students in the Department of Electrical and Computer Engineering.

#### University Policy on Grades

The [university policy on grading](#) offers details concerning university grading principles for students taking courses and covers the specifics of assigning and changing grades, grading options, drop/withdrawals and course repeats. It also defines the undergraduate and graduate grading standards.

#### 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. Grades lower than 'C', meaning C- or below, are considered failure in CIT and will not count toward degree requirements.

Students must receive a "B-" grade or better in both the graduate and undergraduate courses for the course to count towards the Ph.D. requirements.

#### 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 last day of classes. This will result in a 'W' on the transcript, which is not factored into the QPA. To withdraw, the [Course Withdrawal request form](#) must be completed and submitted to the academic advisor for approval. If approved, the academic advisor will send the form to the HUB for processing. Students should confer with their faculty advisors before withdrawing from a course.

#### Process for Appealing Final Grades

<https://www.cmu.edu/student-affairs/theword/academic/appeal-of-grades-and-academic-actions.html>

Final grades will be changed only in exceptional circumstances and only with the approval of the instructor and the department, unit, or program. Grading is a matter of sound discretion of the instructor and final grades are rarely changed without the consent of the instructor who assigned the grade. The following circumstances are the unusual exceptions that may warrant a grade appeal: (a) the final grade assigned for a course is based on manifest error (e.g. a clear error such as arithmetic error in computing a grade or failure to grade one of the answers on an exam), or (b) the faculty or staff member who assigned the grade did so in violation of a University policy.

## Policy on Grades for Transfer Courses

<https://www.cmu.edu/policies/student-and-student-life/transfer-credit-evaluation-and-assignment.html>

Carnegie Mellon University offers students the opportunity to take courses for credit through a cross-registration program (see Pittsburgh Council on Higher Education [PCHE] and Cross-registration section below) and through the receipt of transfer credit from other accredited institutions. The Carnegie Mellon University transcript will include information on such courses as follows: Carnegie Mellon courses and courses taken through the university's cross-registration program will have grades recorded on the transcript and be factored into the QPA. All other courses will be recorded on this transcript indicating where the course was taken, but without grade. Such courses will not be taken into account for academic actions, honors or QPA calculations. (Note: Suspended students may take courses elsewhere; however, they may receive transfer credit only if their college's and department's policies allow this.)

## 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 'C' 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 is 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.

## Academic Integrity

Students at Carnegie Mellon are engaged in preparation for professional activity of the highest standards. Each profession constrains its members with both ethical responsibilities and disciplinary limits. To assure the validity of the learning experience a university establishes clear standards for student work.

In any presentation, creative, artistic, or research, it is the ethical responsibility of each student to identify the conceptual sources of the work submitted. Failure to do so is dishonest and is the basis for a charge of cheating or plagiarism, which is subject to disciplinary action.

ECE adheres to Carnegie Mellon's [policy on academic integrity](#) and all students are expected to review the policies prior to their arrival at CMU. ECE also adheres to [CIT's policy](#) on graduate student academic integrity violations.

Please review the University Policy on Academic Integrity (<https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>). The policy includes the University expectations around academic integrity and provides definitions of cheating, plagiarism, and unauthorized assistance.

A review of the University's Academic Disciplinary Actions procedures (<https://www.cmu.edu/student-affairs/theword/academic-discipline/index.html>) is also recommended. These procedures outline the process for investigating, reporting, and adjudicating violations of the University Policy on Academic Integrity. The procedures also outline the appeal process.

Instructors are responsible for defining academic integrity for students in their courses, including student performance expectations and attendance requirements. Students are responsible for understanding and abiding by the instructor's academic integrity policies. Policies may vary from instructor to instructor and students should seek further guidance from a faculty member if they have specific questions about a course's academic integrity policy.

### Penalties for Violating Academic Integrity

Should an instructor believe that an academic integrity violation has occurred, they may consult with the Office of [Community Standards & Integrity](#), who will assist the faculty member in handling a possible academic integrity violation and, if a student is found responsible for violating academic integrity policies, determining possible sanctions. In accordance with the university's policy, a student who violates the academic integrity policy will not be permitted to drop the course in which the offense occurred in order to avoid penalty. If the student attempts to drop the course, they will be reenrolled.

After a second academic integrity violation, the ECE Department will recommend to the Academic Review Board that you will be dismissed from ECE. For more information on the policies and procedures surrounding academic integrity, please see the website for the [Standards & Integrity](#).

### Disciplinary Probation

Students who have committed an academic integrity violation are placed on disciplinary probation within the department for the remainder of their academic program. While on probation, students are allowed to continue with the program but must meet with their academic advisor.

## 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.



Milestones	Semester									
	F1	S1	F2	S2	F3	S3	F4	S4	F5	S5
Research	X	X	X	X	X	X	X	X	X	X
Courses & Breadth	2 classes	2 classes	2 classes	2 classes						
Qualifying Exam				X students incoming F15	X students enrolled prior to F15					
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.

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 is approved to count towards the ECE Ph.D. degree, except for any project, seminar and independent study courses. Courses in the Computer Science Department (CSD) that are 15-700 or higher and are non-project, non-seminar or non-independent study courses are also approved.

Undergraduate courses that are pre-approved to count towards the ECE Ph.D. include ECE undergraduate courses 300 or above (18-3XX) and CSD courses 300 or above (15-3XX).

### 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:

- 18-601 (12 units)
- 18-603 (12 units)
- 18-605 (12 units)
- 18-606 (12 units)
- 18-700 (12 units)
- 18-703 (12 units)
- 15-894 (12 units)
- 18-701 (6 units)
- 18-702 (6 units)
- 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 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

Students matriculating in the Fall 2015 semester or afterwards 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 timetable.

Students matriculating prior to Fall 2015 must take the Ph.D. Qualifying Exam for the first time no later than the fifth semester after being admitted to the Ph.D. program, and must pass the exam no later than the sixth semester after being admitted to the Ph.D. program. Summer semesters are not included in this qualifying exam timetable. Students are encouraged to take the Ph.D. qualifying exam as soon as possible.

Each student should determine with her or his advisor when to take the qualifying exam the first time.

The time clock determining when a student must take the qualifying exam is stopped for one semester if the student is engaged in a full-time industrial internship during an academic year semester (fall or spring). This policy applies for up to one semester of internship experience. Students engaged in internships for more than one academic semester must petition to ECE's Graduate Studies Committee to request a deferment of the qualifying exam timeline beyond one semester. Please note that there is no guarantee that such petitions will be approved.

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

## 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 Graduate 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.

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.)
- Section SV: For all Silicon Valley students studying in Silicon Valley. (SV 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](#)

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. 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.

Students may complete a TI for a course outside of ECE or during the summer semester, though it must be approved by the Associate Department Head for Academic Affairs and recorded by the Associate Director of Student and Academic Affairs prior to the student starting the TI. Students should contact the Graduate Affairs office 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:

Program	Teaching Requirements
<b>CMU   Portugal Dual Degree Program</b>	CMU   Portugal dual degree students will complete one TI in Pittsburgh and one TI in Portugal.

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.

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](#).

### *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](#). For more information about requirements, see the “Evaluation & Certification of English Fluency for Instructors” section in the University Policies of this handbook.

## Prospectus

All Ph.D. students 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. This time

clock begins with the semester following the Qualifying Examination. If a student leaves for a semester to return to industry, this four-semester clock is 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.

Regarding time clocks, it is important to note the following:

- A calendar year has three semesters: spring, summer, and fall.
- While the prospectus clock may stop during an industry internship, the time clock for the overall Ph.D. program does not stop.

### 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 these 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 45-60 minute presentation on his/her prospectus, and then participate in a question-and-answer-based discussion with his/her committee.

### 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 four committee members must actively participate in both the prospectus meeting and defense and at least three committee members must be physically present. It is desirable to have all committee members participate in person; however, a student is allowed to have one committee member of four participate by teleconferencing. Any deviation from this teleconferencing policy is exceptional and additional information must be provided on the 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](mailto:help@ece.cmu.edu) for assistance in setting up teleconferencing equipment.

### Prospectus Procedure

Once the date, time and place of the prospectus have been confirmed, the student should email the completed [Prospectus Declaration form](#) to the Graduate Affairs Office at least one week before the presentation. An electronic copy of the proposal paper should be submitted to the Ph.D. Academic Program Advisor on or after the presentation date.

Students will be notified by the Graduate Affairs Office of the approval of their committee. Once the committee has been approved, the student will meet with his or her committee to present the prospectus to them. 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. If the prospectus is not accepted, the student will be asked to revise it and meet again with the committee for approval. If the prospectus is accepted, then students should continue to move forward with his or her thesis.

### Milestone Review

Upon completion of the prospectus proposal, students should make an appointment to meet with the Ph.D. Academic Program Advisor to review the fulfillment of Course and Breadth Area requirements, as well as Teaching Internship (TI) requirements. Provided that the student has satisfied the aforementioned program milestones, he/she may be informed of their eligibility for All But Dissertation (ABD) status.

### All But Dissertation Status

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 continue enrolling for 36 units each semester and will continue to receive stipend support.



- 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 Graduate 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 Graduate 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 Ph.D. thesis is written, the student must submit the [Defense Declaration form](#) to the Graduate Affairs Office 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 Defense Declaration Form. 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](mailto: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 Graduate 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 Graduate 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 who have passed the qualifying exam 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.

ECE will enroll all students who are pursuing an internship for a 3-unit credit bearing internship course (18-996, 18-997, & 19-998) Internship for Electrical and Computer Engineering Graduate Students), which can each be taken once each throughout the student's ECE Ph.D. degree program of study. This internship will appear on a student's transcript. Ph.D. students typically are not charged summer tuition, including the Internship course. However, in the event that a student takes another summer class, summer tuition may be assessed for the summer internship course as well. Please contact your academic advisor and reference CIT's current [cost of attendance website](#). 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.

Eligible international students who are interested in pursuing off-campus internships must meet with departmental and OIE representatives. 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.

## 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, AND 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 Finance Office](#), located in HH 1116. 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 2022-2023, this tuition is valued at approximately \$46,400. 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>

Estimated charges for ECE Ph.D. degree:

<i>Type</i>	<i>FY19 \$</i>	<i>semesters Frequency</i>	<i>entire program</i>	<i>first semester</i>
			<i>12</i>	
Application Fee*	\$75	one time	\$75	\$75
Registration Fee	\$0	n/a	\$0	\$0
Enrollment Deposit	\$0	n/a	\$0	\$0
Ph.D. Tuition	\$22,650	per semester	\$278,400	\$23,200
Activity Fee	\$108	per semester	\$1,296	\$108
Technology Fee	\$210	per semester	\$2,520	\$210
Transportation Fee	\$108	per semester	\$1,296	\$108
Books and Supplies	\$1,106	per semester	\$13,272	\$1,106
Student Tuition Recovery (STRF)	\$0	n/a	\$0	\$0
			<b>\$297,684</b>	<b>\$24,807</b>

Unless noted otherwise, stipend payments will be disbursed twice a month (semi-monthly) following the academic year cycle (August 16<sup>th</sup> through August 15<sup>th</sup> 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 stipend for Silicon Valley Ph.D. students is equal to \$3,430 per month (\$41,160 for the academic year) for the 2022-2023 academic year to allow for the increased cost of living in the Silicon Valley area. Silicon Valley Ph.D. students can apply for up to \$1,000 of travel reimbursement from the ECE Department for the Qualifying Exam. More details about the reimbursement procedure will be communicated upon the submission of the Qualifying Exam Declaration.

Stipend amounts are reviewed each year and augmented according to increases in the cost of living. Such increases will be communicated to students prior to the following academic year. When deciding on the stipend amount, The department takes into consideration personal expenses, such as rent/utilities, health insurance, other insurance, childcare, etc.

### 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 his/her 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 Graduate Affairs Office prior to the 10<sup>th</sup> 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

his/her 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, the PAT Transit Fee, and for health insurance. Students are encouraged to check their SIO regularly to ensure that all outstanding balances are addressed. Many students pay for their Carnegie Mellon health insurance and other charges **directly from their stipend.**

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

## Taxes

The deadline for local, state, and federal taxes is April 15. You can obtain tax forms in the mail, at the post office, or at the Carnegie Library. Questions about your tax status should be addressed to the IRSTeleTax at 412-261-1040, or the Pennsylvania Department of Revenue at 412-565-7540. Although subject to federal taxes, student stipends are generally not assessed local or state taxes.

## 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

### University Financial Aid

Graduate students should consult the graduate student financial aid information found on **the HUB's Student Financial Aid website**. Students will find the Graduate Financial Aid Guide, information about funding options and how to apply for financial aid and other helpful links.

Additional information on federal and state aid, and financial aid policies, may be found in APPENDIX D.

### Emergency Loans

The Office of the Dean of Student Affairs offers short-term emergency loans for supplies, medication, food or other unexpected circumstances. The loans are interest-free and for short periods of time (not longer than a month). Graduate students who find themselves in need of immediate funds for emergency situations should contact the **Office of the Dean of Student Affairs** to inquire about an Emergency Student Loan (see Appendix A).



## 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.

## 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 Graduate Education Office. Students can find more information about the application process and deadlines at:

<https://www.cmu.edu/graduate/professional-development/research->

## Teaching Assistantships

Once an ECE Ph.D. student has completed the two required [Teaching Internships](#) (TIs), he or she can continue to teaching assistant for courses for hourly pay instead of receiving academic credit. Students must fill out the [teaching assistant application](#) to formally be matched to a course.

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](#). For more information about requirements, see [Evaluation & Certification of English Fluency for Instructors](#) in the University Policies of this handbook.

## Payroll

Other questions concerning payment options should be addressed to the [ECE Finance Office](#) in HH 1116.

## 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 Department Head. 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 Graduate 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.

## 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.

Carnegie Mellon's Silicon Valley campus hosts programming through our Student Affairs team: Lauren Schachar, Assistant Dean of Student Affairs; Leigh Mason, Assistant Director of Career Services; and Jennifer Wolfeld, Language and Communication Specialist.

[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

CMU Silicon valley has career consultants who provide guidance through one-on-one appointments. Students in Silicon Valley can meet with Assistant Dean of Student Affairs [Lauren Schachar](#) or [Leigh Mason](#), Assistant Director of Career Services. Appointments with Lauren and Leigh 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 the 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.

## Job Classification and Salary Disclosure

The job classification(s) the ECE MS and PhD programs prepares its graduates for can be accessed online via [CMU Box](#).

## UNIVERSITY POLICIES

### Academic Integrity

Students at Carnegie Mellon are engaged in intellectual activity consistent with the highest standards of the academy. The relationship between students and instructors and their shared commitment to overarching standards of respect, honor and transparency determine the integrity of our community of scholars. The actions of our students, faculty and staff are a representation of our university community and of the professional and personal communities that we lead. Therefore, a deep and abiding commitment to academic integrity is fundamental to a Carnegie Mellon education. For more information on these standards, please visit the link below: <http://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>

### Assistance for Individuals with Disabilities

Students with disabilities are encouraged to self-identify with [Office of Disability Resources](#) by contacting [Catherine Getchell](#), 412-268-6121, to access the services available at the University.

### Evaluation & 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](#). Teaching Assistant English Fluency is managed through the International Teaching Assistant testing process administered by CMU's Intercultural Communication Center. For details please visit the links below:

- <http://www.cmu.edu/policies/faculty/evaluation-certification-english-fluency-instructors.html>
- <http://www.cmu.edu/icc/>

### Leave of Absence & Withdrawal Policies

“Leave of absence” means leaving the university temporarily, with the firm and stated intention to return. “Withdrawal” means leaving the university with no intention to return. Withdrawals or leaves taken on or before the university deadline to drop classes without receiving a ‘W’ (withdrawal) grade will result in all courses or grades being removed. Withdrawals or leaves taken after the university deadline to drop classes but before the last day of classes will result in ‘W’ grades assigned to all classes. Withdrawals or leaves taken after the last day of classes will

result in permanent grades assigned by the instructors for each class. After the last day of class, courses cannot be removed from a student's transcript.

International students should consult with the Office of International Education (OIE) prior to taking a leave of absence or withdraw from their program.

Further information about Carnegie Mellon's policy on student leave is available at the following link: <http://www.cmu.edu/policies/student-and-student-life/student-leave.html>

Students who would like to take a leave of absence or withdraw must complete the appropriate form at the following link: <http://www.cmu.edu/hub/forms.html>

Please see "Preparing an Academic Plan" section (under Administrative and Program Policies) of this handbook for ECE's policy on leave of absence and withdrawals.

### Tuition Refund Policy

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>.

### Returning to Carnegie Mellon

When a student plans to return to CMU after a leave of absence, he/she must complete the [Petition for Return from Leave of Absence form](#) at least one month prior to the start of the semester. We recommend doing so prior to the registration period for the upcoming semester (for Fall, April and for Spring, November). 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>.

### Retention of Student Records

The policy of Carnegie Mellon University is to ensure the safety, accessibility, confidentiality, and good condition of the permanent record of every Carnegie Mellon student, past and present.

Carnegie Mellon University (CMU), established in 1900, holds all permanent records of our students (current and former) in the University Registrar's Office. We maintain original paper records in an offsite secure climate-controlled underground storage facility along with a microfilmed copy of each record. In addition, a copy of microfilmed records also resides in the University Registrar's Office in Pittsburgh, PA. This includes all students globally, include those students studying at our California teaching location and instructional sites. CMU has established the University Registrar's Office as the official data steward of all student records.

#### Historical Records 1906-1989

For every student enrolled at Carnegie Mellon University as a new or continuing student prior to the fall semester, 1989, and dating back to 1906, the University Registrar's Office of Carnegie Mellon University maintains a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not within the student's official transcript. The official transcript provides brief personal information to identify the student as

unique. It contains courses, units and grades; semester and cumulative grade point averages; all degrees earned; transfer credit or advanced placement and dean's list indications.

The University Registrar's Office has established and maintains within a microfiche copy of good, readable, and reproducible quality of the student's permanent record in a secured records unit. A secondary permanent microfilm copy of all records will be maintained in good condition in the climate-controlled, fire-proof, limited-access security at an offsite facility.

#### Modern Records 1989-Current

For every student enrolling at Carnegie Mellon University as a new or continuing student beginning in fall semester, 1989, the University Registrar's Office of Carnegie Mellon University will establish and maintain within an electronic data file in the University Student Services Suite (S3, our student information system) a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not. The University Registrar's Office staff will, under the direction of the University Registrar, add to the electronic record such new information as pertains to the student's demographic and academic record as it becomes available, semester-by-semester, and as the student progresses in his/her career at Carnegie Mellon University.

Daily, the Carnegie Mellon University Computing Services Division will perform a backup of all databases that have been altered during that day. Weekly, the Computing Services Division will perform a complete backup of all records within the student data file. The Computing Services Division staff will store the daily backups in the climate-controlled, fire-proof, limited-access security facility in the Computer Operations center in Cyert Hall on the Carnegie Mellon University campus. Upon successful completion of the monthly backup, the Computing Services Division staff will securely transfer the weekly and monthly backups from the preceding month to climate-controlled, fire-proof, secured vault at an offsite facility.

#### Cessation of Operations

In the unlikely event that CMU (which has existed for more than 100 years) ceases to exist, it will make appropriate arrangements to comply with clauses (1) and (2) for all its students consistent with the Commonwealth of Pennsylvania statutes and law. I have an informal plan and agreement with the University of Pittsburgh's University Registrar's Office, that should either school cease, we would exchange student records.

### Safeguarding Educational Equity – Sexual Harassment and Sexual Assault Policy

The University prohibits sex-based discrimination, sexual harassment, sexual assault, dating/ domestic violence and stalking. The University also prohibits retaliation against individuals who bring forward such concerns or allegations in good faith.

The University's Sexual Misconduct Policy is available at <https://www.cmu.edu/policies/administrative-and-governance/sexual-misconduct/index.html>.

The University's Policy Against Retaliation is available at <https://www.cmu.edu/policies/administrative-and-governance/whistleblower.html>.

If you have been impacted by any of these issues, you are encouraged to make contact with any of the following resources:

- Office of Title IX Initiatives, <https://www.cmu.edu/title-ix/> 412-268-7125, [tix@cmu.edu](mailto:tix@cmu.edu)
- University Police, 412-268-2323

Additional resources and information can be found at: <https://www.cmu.edu/title-ix/resources-and-information/resources.html>.

## 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: <http://www.cmu.edu/policies/student-and-student-life/suspension-required-withdrawal-policy.html>

## Withdrawal of a Degree

The university reserves the right to withdraw a degree even though it has been granted should there be discovery granted that the work which it was based on or the academic records in support of it had been falsified. The complete reference to this university policy is available at: <http://www.cmu.edu/policies/student-and-student-life/withdrawal-of-a-degree.html>

## University Grievances

Students are encouraged to discuss any concerns or grievances informally within ECE. If a student is not satisfied with the results of informal discussion or formal appeal at the department level, he or she may follow the guidelines on Graduate Student Appeal and Grievance Procedures. Students are likewise encouraged to speak directly to their graduate student's representatives and to the president of the Graduate Student Assembly (GSA). The complete reference to this policy is available at: <http://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>

## Childbirth/Maternity Accommodation Protocol

<http://www.cmu.edu/graduate/programs-services/maternity-accommodation-protocol.html>

Students whose anticipated delivery date is during the course of the semester may consider taking time away from their coursework and/or research responsibilities. All female students who give birth to a child while engaged in coursework or research are eligible to take either a short-term absence or formal leave of absence. Students are encouraged to consult with relevant university faculty and staff as soon as possible as they begin making plans regarding time away.

- Students in course work should consider either working with their course instructor to receive incomplete grades, or elect to drop to part-time status or to take a semester leave of absence.
- Students engaged in research must work with their faculty to develop plans for the research for the time they are away.
- Students must contact the Office of the Dean of Student Affairs to register for Maternity Accommodations. Students will complete an information form and meet with a member of the Dean's Office staff to determine resources and procedures appropriate for the individual student.

- o Planning for the student's discussion with her academic contact(s) (advisor, associate dean, etc.) may be reviewed during this meeting.
- Doctoral students who receive an academic stipend funded by Carnegie Mellon are eligible to continue to receive stipend funding for up to six (6) weeks during a Short-Term Maternity Accommodation or a Formal Leave of Absence. Continued academic stipend funding may be extended by two (2) weeks, for a total of eight (8) weeks, if an absence longer than six weeks is medically necessary. To receive this support students must be registered with the Office of the Dean of Student Affairs for maternity accommodation.

## Consensual Intimate Relationship Policy Regarding Undergraduate Students

<https://www.cmu.edu/policies/student-and-student-life/consensual-relationships.html>

This policy addresses the circumstances in which romantic, sexual or amorous relationships/interactions with undergraduate students, even if consensual, are inappropriate and prohibited. The purpose of this policy is to assure healthy professional relationships. This policy is not intended to discourage consensual intimate relationships unless there is a conflicting professional relationship in which one party has authority over the other as in the policy.

## Verification of Employment

Carnegie Mellon University employees or former employees are required to use Employment Verification Request Form to request employment verification. Vendors, such as mortgage companies, may continue to use standard formats with a signed authorization. Details and forms are available at <https://www.cmu.edu/hr/resources/hr-partners/hr-services/>.

## 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.

## Employment Eligibility Verification

If you are receiving a stipend, are a TA, or are planning to have a position with CMU then Employment Eligibility Verification is required. Form I-9 must be completed within 3 business days of beginning work for any type of compensation (stipend or employment). Additional details are highlighted below. To ensure compliance with federal law, Carnegie Mellon University maintains the [Employment Eligibility Verification \(I-9\) Policy \[pdf\]](#) covering the university's I-9 and E-Verify requirements:

- Every individual receiving a stipend from CMU or employed by CMU must comply with the I-9 Policy by completing the Form I-9 within three business days following the first day of stipend start date/employment.

- Individuals who expect to work on a federally funded project are further responsible for submitting an E-Verify Processing Request Form to the Office of Human Resources if required.
- For more information, please see CMU's [Guidance for Completing the Form I-9 and E-Verify Requirements at CMU \[pdf\]](#), or visit the Human Resources Service website to [learn more about Form I-9 and E-Verify](#) and to [schedule an appointment to complete the Form I-9](#).



**Appendix A**  
**2022-2023**  
**Highlighted University Resources for Graduate Students**  
**and**  
**The WORD, Student Handbook**

**Key Resources for Graduate Student Support**

- Office of Graduate and Postdoc Affairs
- Office of the Dean of Students
- Center for Student Diversity and Inclusion
- Assistance for Individuals with Disabilities
- Eberly Center for Teaching Excellence and Educational Innovation
- Graduate Student Assembly
- Office of International Education
- Veterans and Military Community
- Ethics Reporting Hotline
- Policy Against Retaliation

**Key Resources for Academic and Research Support**

- Computing and Information Resources
- Student Academic Success Center
- University Libraries
- Research at CMU
- Office of Research Integrity & Compliance

**Key Resources for Health, Wellness & Safety**

- Counseling and Psychological Services
- University Health Service
- Campus Wellness
- Religious and Spiritual Life Initiatives
- University Police
- Shuttle and Escort Services
- The WORD

### **Office of Graduate and Postdoc Affairs**

[www.cmu.edu/graduate](http://www.cmu.edu/graduate); [grad-ed@cmu.edu](mailto:grad-ed@cmu.edu)

The Office of Graduate and Postdoc Affairs provides central support for all master's and doctoral students, as well as academic programs, with a focus on supporting graduate student success at Carnegie Mellon.

Examples of resources offered through the Office of Graduate and Postdoc Affairs include but are not limited to:

- Website with university resources, contact information for CMU programs and services, calendar of events related to graduate students
- Bi-monthly newsletter to all graduate students with information on activities, resources and opportunities
- Professional Development Seminars and Workshops
- GSA/Provost Conference Funding Grants
- GSA/Provost Small Research Grants (GuSH)
- Consultations on issues related to the graduate student experience

The Office of Graduate and Postdoc Affairs also works with the colleges and departments by informing and assisting in developing policy and procedures relevant to graduate students and working with departments on issues related to graduate students. Additionally we partner with many other offices and organizations, such as the Graduate Student Assembly, to support the holistic graduate student educational experience.

### **Office of the Dean of Students**

<https://www.cmu.edu/student-affairs/dean>

The Office of the Dean of Students provides central leadership of the metacurricular experience at Carnegie Mellon including the coordination of student support. Vice President of Student Affairs and Dean of Students Gina Casalegno leads the Division of Student Affairs which includes the offices and departments listed below (not an exhaustive list).

Graduate students will find the enrollment information for [Domestic Partner Registration and Childbirth/Maternity Accommodations](#) in the Office of the Dean of Students or on their [website](#). This Office also manages the [Student Emergency Support Funding](#) process. There are three forms of support funding for enrolled students: emergency student loans, maternity loans, and the Tartan Emergency Support Fund. These funds are made available through generous gifts of alumni and friends of the university as well as support from student organizations, Undergraduate Student Senate and the Graduate Student Assembly. Students will be provided with additional information about the various types of funding during a consultation meeting with a member of the Dean of Students team. Tuition costs are not eligible for Student Emergency Support funding.

Additional resources for graduate students include [College Liaisons](#) and the [Student Support Resources](#) team. [College Liaisons](#) are senior members of the Division of Student Affairs who work with departments and colleges addressing student concerns across a wide range of issues. College Liaisons are identified on the student SIO page in the Important Contacts list. The Student Support Resources team offers an additional level of support for students who

are navigating any of a wide range of life events. [Student Support Resources](#) staff members work in partnership with campus and community resources to provide coordination of care and support appropriate to each student's situation.

**The Division of Student Affairs includes (not an exhaustive list):**

- Athletics, Physical Education and Recreation
- Career and Professional Development Center (CPDC)
- Center for Student Diversity and Inclusion
- Cohon University Center
- Counseling & Psychological Services (CaPS)
- Dining Services
- Office of Community Standards and Integrity (OCSI)
- [Office of Student Leadership, Involvement, and Civic Engagement \(SLICE\)](#)
- University Health Services (UHS)
- Wellness Initiatives

**Center for Student Diversity & Inclusion**

<https://www.cmu.edu/student-diversity/>

Diversity and inclusion have a singular place among the values of Carnegie Mellon University. The Center for Student Diversity & Inclusion actively cultivates a strong, diverse and inclusive community capable of living out these values and advancing research, creativity, learning and development that changes the world.

The Center offers resources to enhance an inclusive and transformative student experience in dimensions such as access, success, campus climate and intergroup dialogue. Additionally, the Center supports and connects historically underrepresented students and those who are first in their family to attend college in a setting where students' differences and talents are appreciated and reinforced, both at the graduate and undergraduate level. Initiatives coordinated by the Center include, but are not limited to:

- First generation/first in family to attend college programs
- LGBTQ+ Initiatives
- Race and ethnically-focused programs, including Inter-University Graduate Students of Color Series (SOC) and PhD SOC Network
- Women's empowerment programs, including Graduate Women's Gatherings (GWGs) ▪ Transgender and non-binary student programs

**Assistance for Individuals with Disabilities**

<http://www.cmu.edu/disability-resources/>

The Office of Disability Resources at Carnegie Mellon University has a continued mission to provide physical, digital, and programmatic access to ensure that students with disabilities have equal access to their educational experience. We work to ensure that qualified individuals receive reasonable accommodations as guaranteed by the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act of 1973. Students who would like to receive accommodations can begin the process through [Disability Resources'](#)

[secure online portal](#) or email [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) to begin the interactive accommodation Process.

Students with physical, sensory, cognitive, or emotional disabilities are encouraged to selfidentify with the Office of Disability Resources and request needed accommodations. Any questions about the process can be directed to [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu), or call (412) 268- 6121.

### **Eberly Center for Teaching Excellence & Educational Innovation**

[www.cmu.edu/teaching](http://www.cmu.edu/teaching)

We offer a wide variety of confidential, consultation services and professional development programs to support graduate students as teaching assistants or instructors of record during their time at Carnegie Mellon University and as future faculty members at other institutions. Regardless of one's current or future teaching context and duties, our goal is to disseminate evidence-based teaching strategies in ways that are accessible and actionable. Programs and services include campus-wide Graduate Student Instructor Orientation events and our Future Faculty Program, both of which are designed to help participants be effective and efficient in their teaching roles. The Eberly Center also assists departments in creating and conducting customized programs to meet the specific needs of their graduate student instructors. Specific information about Eberly Center support for graduate students is found at [www.cmu.edu/teaching/graduatestudentsupport/index.html](http://www.cmu.edu/teaching/graduatestudentsupport/index.html).

### **Graduate Student Assembly**

[www.cmu.edu/stugov/gsa/index.html](http://www.cmu.edu/stugov/gsa/index.html)

The Graduate Student Assembly (GSA) is the branch of Carnegie Mellon Student Government that represents, and advocates for the diverse interests of all graduate students at CMU. GSA is composed of representatives from the different graduate programs and departments who want to improve the graduate student experience at the different levels of the university. GSA is funded by the Student Activities Fee from all graduate students. GSA passes legislation, allocates student activities funding, advocates for legislative action locally and in Washington D.C. on behalf of graduate student issues and needs, and otherwise acts on behalf of all graduate student interests. Our recent accomplishments are a testament to GSA making a difference, and steps to implementing the vision laid out by the strategic plan. <https://www.cmu.edu/stugov/gsa/About-the-GSA/Strategic-Plan.html>.

GSA offers an expanding suite of social programming on and off-campus to bring graduate students from different departments together and build a sense of community. GSA is the host of the Graduate Student Lounge on the 3rd floor of the Cohon University Center- a great place to study or meet up with friends. GSA also maintains a website of graduate student resources on and off-campus. Through GSA's continued funding for professional development and research conferences, the GSA/Provost Conference Funding Program and GSA/Provost GuSH Research Grants are able to run, as managed by the Graduate Education Office. As we move forward, GSA will continue to rely on your feedback to improve the graduate student experience at CMU. Feel free to contact us at [gsa@cmu.edu](mailto:gsa@cmu.edu) to get involved, stop by our office in the Cohon University Center Room 304 or become a representative for your Department.

## **Office of International Education (OIE)**

<http://www.cmu.edu/oie/>

Carnegie Mellon hosts international graduate and undergraduate students who come from more than 90 countries. The Office of International Education (OIE) is the liaison to the University for all non-immigrant students and scholars, as well the repository for study abroad opportunities and advisement. OIE provides many services including: advising on personal, immigration, study abroad, academic, and social and acculturation issues; presenting programs of interest such as international career workshops, tax workshops, and cross-cultural and immigration workshops; international education and statistics on international students in the United States; posting pertinent information to students through email and the OIE website, and conducting orientation and pre-departure programs.

## **Services to International Students**

Carnegie Mellon University's Office of International Education (OIE) provides visa services for F-1 and J-1 international students and vouches for the status of international students on CMU documents as required by Department of Homeland Security regulations. These services, and related services such as advising and preparation of required documents, are provided to students at no additional charge.

## **Veterans and Military Community**

<http://www.cmu.edu/veterans/>

Military veterans are a vital part of the Carnegie Mellon University community. Graduate students can find information on applying for veteran education benefits, campus services, veteran's groups at CMU, and non-educational resources through the Veterans and Military Community website. There are also links and connections to veteran resource in the Pittsburgh community. The ROTC and Veteran Affairs Coordinator can be reached at [urovaedbenefits@andrew.cmu.edu](mailto:urovaedbenefits@andrew.cmu.edu) or 412-268-8747.

## **Carnegie Mellon Ethics Hotline**

<https://www.cmu.edu/hr/resources/ethics-hotline.html>

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity, violations of university policy, or violations of law.

Topic areas for reporting may include, but are not limited to:

- Academic and Student Life
- Bias Reporting
- Discriminatory Harassment / Sexual Misconduct / Title IX
- Employee Misconduct
- Employment Related
- Environmental Health and Safety / Pandemic Safety
- Financial Matters
- Health and Wellness
- Information Systems and Data Privacy
- Public Safety & Criminal Activity
- Research & Intellectual Property

Students, faculty and staff can anonymously file a report by calling 1-844-587-0793 or visiting [cmu.ethicspoint.com](http://cmu.ethicspoint.com). All submissions are reported to appropriate university personnel and handled discreetly.

**The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.**

### **Policy Against Retaliation**

It is the policy of Carnegie Mellon University to protect from retaliation any individual who makes a good faith report of a suspected violation of any applicable law or regulation, university Policy or procedure, any contractual obligation of the university, and any report made pursuant to the Carnegie Mellon University Code of Business Ethics and Conduct.

Additional details regarding the Policy Against Retaliation are available at <https://www.cmu.edu/policies/administrative-and-governance/whistleblower.html>

### **Key Offices for Academic & Research Support**

#### **Computing and Information Resources**

[www.cmu.edu/computing](http://www.cmu.edu/computing)

Computing Services maintains and supports computing resources for the campus community, including the campus wired and wireless networks, printing, computer labs, file storage, email and software catalog. As members of this community, we are all responsible for the security of these shared resources. Be sure to review the Safe Computing (<https://www.cmu.edu/computing/safe/>) section and the University Computing Policy (<https://www.cmu.edu/policies/information-technology/computing.html>)

Visit the Computing Services website (<https://www.cmu.edu/computing/>) to learn more. For assistance the Computing Services Help Center is available at 412-268-4357 (HELP) or [ithelp@Cmu.edu](mailto:ithelp@Cmu.edu).

#### **Student Academic Success Center**

<https://www.cmu.edu/student-success/>

Student Academic Support Programs

#### **Communication and Language Support**

Communication Support: The program offers free consultations for all CMU students on their written, oral, and visual projects. Our trained communication consultants help communicators convey ideas clearly and effectively on a variety of STEM and humanities topics. Consultants support communication excellence on essays, technical reports, oral presentations, slides, data visualization, advanced English language learning, and many other project types. Clients can bring in a project at any stage including brainstorming ideas, organizing thoughts, responding to instructor feedback, or putting finishing touches on the final draft. Support is offered in several modes:

- *One-on-one communication tutoring* (in-person or Zoom synchronous meeting)--Clients meet with a consultant to improve the logic, clarity, and flow of writing or presentation and receive expert feedback that will strengthen a project. When making an appointment, clients upload a draft, instructor prompts, and rubrics so consultants can use specific criteria to give relevant feedback. See the [appointment types](#) offered.

- *Video response* (asynchronous)--Clients upload documents in advance, then receive a 20- to 30-minute recorded video with a consultant's feedback. The feedback video will be received within 5 days after the scheduled appointment.
- *Group appointments*--Participate with your group to accomplish peer reviews or focus on collaborative presentation strategies.
- *Workshops*--Workshops are available on a variety of topics and help attendees learn research-backed communication strategies.
- *Resources*--An online collection of handouts and videos that concisely explain specific communication strategies are available.

### **Language and Cross-cultural Support:**

More than 60% of graduate students at Carnegie Mellon are international students, and others are nonnative speakers of English who have attended high school or undergraduate programs in the US. Many of these students want to hone their language and cross-cultural skills for academic and professional success.

Students can make an appointment with a Language Development Specialist to get individualized coaching on language or cross-cultural issues. Students can choose from sessions on

- giving how to give a strong presentation,
  - writing academic emails,
  - analyzing expectations and strategies for clear academic writing,
  - talking how to talk about oneself as a professional in the U.S.,
  - developing clearer pronunciation,
  - using accurate grammar,
  - building fluency, and more.
- Students can make an appointment with a Language Development Specialist to get individualized coaching on language or cross-cultural issues.

The Student Academic Success Center is also charged with certifying the language of International Teaching Assistants (ITAs), ensuring that nonnative English speakers have the language proficiency needed to succeed as teaching assistants in the Carnegie Mellon classroom.

Students preparing to do an ITA Certification should plan to take classes offered by the language support team at the SASC from the beginning of their first semester. Start by contacting the language support team at the SASC website or attend a Language Support Orientation at the SASC or in your department.

### **Learning Support**

**Academic Coaching:** Academic Coaching provides holistic one-on-one peer support and group workshops to help students find and implement their conditions for success. We assist students in improving time management, productive habits, organization, stress management, and study skills. Students will request support through the Academic Success Center website and attend in-person meetings or meet using video and audio conferencing technology to provide all students with support.

**Peer Tutoring:** Weekly Tutoring Appointments are offered in a one-on-one and small group format to students from any discipline who need assistance with a course that may not be supported by our other services. Weekly appointments give students the opportunity to interact regularly with the same tutor to facilitate deeper understanding of concepts. Students can register online through the Student Academic Success website.

**“Just in Time” Workshops:** The Student Academic Success team is available to partner with instructors and departments to identify skills or concepts that would benefit from supplemental offerings (workshops, boot camps) to support students’ academic success

and learning. We are eager to help convene and coordinate outside of the classroom skill-building opportunities that can be open to any student interested in building skill or reinforcing course concept mastery.

### **University Libraries**

[www.library.cmu.edu](http://www.library.cmu.edu)

The University Libraries offers a wide range of information resources and services supporting graduate students in course-work, research, teaching, and publishing. The library licenses and purchases books, journals, media and other needed materials in various formats. Library liaisons, consultants and information specialists provide in-depth and professional assistance and advice in all-things information - including locating and obtaining specific resources, providing specialized research support, advanced training in the use and management of data. Sign up for workshops and hands-on topic-specific sessions such as data visualization with Tableau, cleaning data with OpenRefine, and getting started with Zotero. Weekly drop-in hours for Digital Humanities and for Research Data Research Management are scheduled during the academic year. Start at the library home page to find the books, journals and databases you need; to identify and reach out to the library liaison in your field; to sign up for scheduled workshops; and to connect with consultants in scholarly publishing, research data management, and digital humanities.

### **Research at CMU**

[www.cmu.edu/research/index.shtml](http://www.cmu.edu/research/index.shtml)

The primary purpose of research at the university is the advancement of knowledge in all fields in which the university is active. Research is regarded as one of the university's major contributions to society and as an essential element in education, particularly at the graduate level and in faculty development. Research activities are governed by several university policies. Guidance and more general information is found by visiting the Research at Carnegie Mellon website.

### **Office of Research Integrity & Compliance**

[www.cmu.edu/research-compliance/index.html](http://www.cmu.edu/research-compliance/index.html)

The Office of Research Integrity & Compliance (ORIC) is designed to support research at Carnegie Mellon University. The staff work with researchers to ensure research is conducted with integrity and in accordance with federal and Pennsylvania regulation. ORIC assists researchers with human subject research, conflicts of interest, responsible conduct of research, export controls, and institutional animal care & use. ORIC also provides consultation, advice, and review of allegations of research misconduct.

### **Key Offices for Health, Wellness & Safety**

#### ***Counseling & Psychological Services***

<https://www.cmu.edu/counseling/>

Counseling & Psychological Services (CaPS) affords the opportunity for students to talk privately about academic and personal concerns in a safe, confidential setting. An initial consultation at CaPS can help clarify the nature of the concern, provide immediate support, and explore further options if needed. These may include a referral for counseling within CaPS, to another resource at Carnegie Mellon, or to another resource within the larger Pittsburgh



community. CaPS also provides workshops and group sessions on mental health related topics specifically for graduate students on campus. CaPS services are provided at no cost. Appointments can be made in person, or by telephone at 412-268-2922.

### **Health Services**

[www.cmu.edu/HealthServices/](http://www.cmu.edu/HealthServices/)

University Health Services (UHS) is staffed by physicians, advanced practice clinicians and registered nurses who provide general medical care, allergy injections, first aid, gynecological care and contraception as well as on-site pharmaceuticals. The CMU Student Insurance Plan covers most visit fees to see the physicians and advanced practice clinicians & nurse visits. Fees for prescription medications, laboratory tests, diagnostic procedures and referral to the emergency room or specialists are the student's responsibility and students should review the UHS website and their insurance plan for detailed information about the university health insurance requirement and fees.

UHS also has a registered dietician and health promotion specialists on staff to assist students in addressing nutrition, drug and alcohol and other healthy lifestyle issues. In addition to providing direct health care, UHS administers the Student Health Insurance Program. The Student Health Insurance plan offers a high level of coverage in a wide network of health care providers and hospitals. Appointments can be made by visiting UHS's website, walk-in, or by telephone, 412-268-2157.

### **Campus Wellness**

<https://www.cmu.edu/wellness/>

At Carnegie Mellon, we believe our individual and collective well-being is rooted in healthy connections to each other and to campus resources. The university provides a wide variety of wellness, mindfulness and connectedness initiatives and resources designed to help students thrive inside and outside the classroom. The BeWell@CMU e-newsletter seeks to be a comprehensive resource for CMU regarding all wellness-inspired events, announcements and professional and personal development opportunities. Sign up for the Be Well monthly newsletter via <https://bit.ly/BeWellNewsletter> or by contacting the Program Director for Student Affairs Wellness Initiatives, at [alusk@andrew.cmu.edu](mailto:alusk@andrew.cmu.edu).

### **Religious and Spiritual Life Initiatives (RSLI)**

[www.cmu.edu/student-affairs/spirituality](http://www.cmu.edu/student-affairs/spirituality)

Carnegie Mellon is committed to the holistic growth of our students, including creating opportunities for spiritual and religious practice and exploration. We have relationships with local houses of worship from various traditions and many of these groups are members of CMU's Council of Religious Advisors. We also offer programs and initiatives that cross traditional religious boundaries in order to increase knowledge of and appreciation for the full diversity of the worldview traditions. Our RSLI staff are here to support students across the spectrum of religious and spiritual practice and would be more than happy to help you make a connection into a community of faith during your time at CMU.

### **University Police**

<http://www.cmu.edu/police/>

412-268-2323

The University Police Department is located at 4551 Filmore Street. The department's

services include police patrols and call response, criminal investigations, fixed officer and foot officer patrols, event security, and crime prevention and education programming as well as bicycle and laptop registration. Visit the department's website for additional information about the staff, emergency phone locations, crime prevention, lost and found, finger print services, and annual statistic reports. Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies and containing statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. Graduate students can obtain a copy by contacting the University Police Department at 412- 268-2323 The annual security and fire safety report is also available online at <https://www.cmu.edu/police/annualreports/>.

### **Shuttle and Escort Services**

Parking and Transportation coordinates the Shuttle Service and Escort Service provided for CMU students, faculty, and community. The [Shuttle & Escort website](#) has full information about these services, stops, routes, tracking and schedules.

### **The WORD**

<http://www.cmu.edu/student-affairs/theword//>

The WORD is Carnegie Mellon University's online student handbook and serves as the foundation for the department (and sometimes college) handbook. The WORD contains university-wide academic policy information and resources, community policies and resources, and describes the university level procedures used to review possible violations of these standards. It is designed to provide all students with the tools, guidance, and insights to help you achieve your full potential as a member of the Carnegie Mellon community. Information about the following is included in The WORD (not an exhaustive list) and graduate students are encouraged to bookmark this site and refer to it often. University policies can also be found in full text at: <http://www.cmu.edu/policies/>.

Carnegie Mellon Vision, Mission  
Statement of Assurance  
Carnegie Mellon Code

### ***Academic Standards, Policies and Procedures***

Educational Goals  
Academic and Individual Freedom  
Academic Disciplinary Actions Overview  
Statement on Academic Integrity Standards for Academic & Creative Life Assistance for Individuals with Disabilities  
Master's Student Statute of Limitations  
Conduct of Classes  
Copyright Policy  
Cross-college & University Registration  
Doctoral Student Status Policy  
Evaluation & Certification of English Fluency for Instructors Final Exams for Graduate Courses  
Grading Policies  
Intellectual Property Policy

Privacy Rights of Students  
Student's Rights

***Research***

Human Subjects in Research  
Office of Research Integrity & Compliance  
Office of Sponsored Programs  
Policy for Handling Alleged Misconduct of Research  
Policy on Restricted Research

**Tax Status of Graduate Student Awards**

***Campus Resources & Opportunities***

Alumni Relations  
Assistance for Individuals with Disabilities  
Athletics, Physical Fitness & Recreation  
Carnegie Mellon ID Cards and Services  
Cohon University Center  
Copying, Printing & Mailing  
Division of Student Affairs  
Domestic Partner Registration  
Emergency Student Loan Program  
Gender Programs & Resources  
Health Services  
Dining Services  
The HUB Student Services Center  
ID Card Services  
Leonard Gelfand Center  
LGBTQ Resources  
Multicultural and Diversity Initiatives  
Opportunities for Involvement  
Parking and Transportation Services  
Shuttle and Escort Services  
Spiritual Development  
University Police  
Student Activities  
University Stores

***Community Standards, Policies and Procedures***

Active Medical Assistance Protocol Alcohol and Drugs Policy  
AIDS Policy  
Bicycle/Wheeled Transportation Policy  
Damage to Carnegie Mellon Property

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## APPENDIX B: ADDITIONAL INFORMATION FOR CALIFORNIA PROGRAMS

Carnegie Mellon University is a private, non-profit institution, approved to operate in California by the California Bureau for Private Post-Secondary Education. Approval to operate means compliance with state standards as set forth in the California Private Postsecondary Education Act of 2009.

Any questions a student may have regarding this catalog that have not been satisfactorily answered by the institution may be directed to the Bureau for Private Postsecondary Education at 1747 North Market Blvd, Suite 225, Sacramento, CA 95834, [www.bppe.ca.gov](http://www.bppe.ca.gov), toll-free telephone number (916) 574-8900 or by fax (916) 263-1897.

As a prospective student, you are encouraged to review this catalog prior to signing an enrollment agreement. You are also encouraged to review the School Performance Fact Sheet, which must be provided to you prior to signing an enrollment agreement.

A student or any member of the public may file a complaint about this institution with the Bureau for Private Postsecondary Education by calling (888) 370-7589 toll-free or by completing a complaint form, which can be obtained on the bureau's internet website, at [www.bppe.ca.gov](http://www.bppe.ca.gov).

Class session will be held:

Carnegie Mellon University  
NASA Ames Research Park  
Bldg. 23  
P.O. Box 98  
Moffett Field, CA 94035-0001  
(650) 603-7032  
[www.cmu.edu/silicon-valley](http://www.cmu.edu/silicon-valley)

### STUDENT'S RIGHT TO CANCEL (WITHDRAWAL/LEAVES OF ABSENCE)

A student has the right to cancel the student's Enrollment Agreement by either taking a leave of absence from the Program (leaving Carnegie Mellon University temporarily with the firm and stated intention of returning) or by withdrawing from the Program (leaving Carnegie Mellon University with no intention of returning). If the student withdraws or take a leave of absence from Carnegie Mellon University, the student may be eligible for a tuition adjustment or a refund of certain fees (excluding any Application Fee, Registration Fee and Enrollment Deposit).

To cancel the student's Enrollment Agreement and take a leave of absence or withdraw, the student must complete Carnegie Mellon University's Leave of Absence or Withdrawal form, as applicable, and return it to Carnegie Mellon University's Registrar's Office, at 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213. The Leave of Absence and Withdrawal forms, and additional information about leaves of absence and withdrawal, can be found on Carnegie Mellon University's website at <https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/>.

If the student notifies Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is the earliest of:

- The date the student began the student's withdrawal or leave of absence process at Carnegie Mellon University;
- The date the student notified the student's home department at Carnegie Mellon University;
- The date the student notified the associate dean of the student's College at Carnegie Mellon University; or
- The date the student notified the Carnegie Mellon University Dean of Student Affairs.

If the student does not notify Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is:

- The midpoint of the relevant semester in which the student withdraws or takes a leave of absence;
- The last date the student attended an academically-related activity such as an exam, tutorial or study group, or the last day the student turned in a class assignment.

## **REFUND POLICY**

1. Refunds in General. Students who withdraw from the Program or take a leave of absence after having paid the current semester's tuition and fees or receiving financial aid are subject to the following refund and repayment policies. No other charges are refundable.
2. Exit Counseling. All borrowers of Federal student loans must complete a Federally mandated exit counseling session when graduating or dropping to less than half-time enrollment status, including by withdrawing or taking a leave of absence. Exit counseling prepares students for repayment. Students must complete an exit counseling session in its entirety, with complete and correct information; otherwise, the student's degree, diploma and official transcripts may be withheld. Information about exit counseling sessions can be found on Carnegie Mellon University's website at <https://www.cmu.edu/sfs/financial-aid/exit-counseling.html>.
3. Withdrawals/Leaves On or Before 10th Class Day (during the Cancellation Period). Students who withdraw or take a leave of absence on or before the 10th class day of the relevant semester will receive a refund of 100% of tuition and fees (excluding any Application Fee or Registration Fee and Enrollment Deposit).

4. Withdrawals/Leaves after 10th Class Day (after the Cancellation Period). Students who withdraw or take a leave of absence after the 10th class day of the relevant semester but before completing 60% of the semester will be assessed tuition based on the number of days completed within the semester. This includes calendar days, class and non-class days, from the first day of classes to the last day of final exams. Breaks which last five days or longer, including the preceding and subsequent weekends, are not counted. Thanksgiving and Spring Break are not counted. STRF will be adjusted accordingly with any adjustment of tuition. There is no tuition adjustment after 60% of the semester is completed. There is no refund of University fees after the 10th class day of the relevant semester.
5. Tuition Adjustment Appeals. Students may appeal to have tuition adjustments for their leave of absence or withdrawal if they feel that they have extenuating circumstances. These appeals will be reviewed in the context of Carnegie Mellon University's tuition adjustment policy, as stated above. These appeals must be made in writing to Carnegie Mellon University's Registrar using Carnegie Mellon University's Tuition Appeal Adjustment form. Information about Carnegie Mellon University's tuition adjustment policy and tuition adjustment appeals can be found on Carnegie Mellon University's website at <https://www.cmu.edu/sfs/tuition/adjustment>.
6. Repayment to Lenders/Third Parties. If any portion of refundable tuition and/or fees was paid from the proceeds of a loan or third party, the refund may be sent to the lender, third party or, if appropriate, to the Federal or state agency that guaranteed or reinsured the loan, as required by law and/or Carnegie Mellon University policy. Any amount of the refund in excess of the unpaid balance of the loan shall be first used to repay any student financial aid programs from which the student received benefits, in proportion to the amount of the benefits received, and any remaining amount shall be paid to the student.
7. Responsibility for Loan. If the student obtains a loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If the student has received Federal student financial aid funds, the student is entitled to a refund of moneys not paid from Federal student financial aid program funds. If the student is eligible for a loan guaranteed by the Federal or state government and the student defaults on the loan, both of the following may occur: 1) The Federal or state government or a loan guarantee agency may take action against the student, including applying any income tax refund to which the person is entitled to reduce the balance owed on the loan. 2) The student may not be eligible for any other Federal student financial aid at another institution or other government assistance until the loan is repaid.

Meeting the cost of a graduate education is a significant investment. Carnegie Mellon University is committed to making it financially possible for graduate students to enhance educational development and reach their career goals. There are many financial aid resources available to students pursuing graduate studies at Carnegie Mellon University. Carnegie Mellon University participates in a number of Federal and state financial aid programs. Information about these financial aid programs can be found on Carnegie Mellon University's website, at <http://www.cmu.edu/finaid/index.html>.

If you obtain a loan to pay for the M.S. in Electrical and Computer Engineering or Software Engineering degree programs on the Silicon Valley campus, you will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If you have received federal student financial aid funds, you are entitled to a refund of moneys not paid from federal student financial aid program funds.

Carnegie Mellon University does not have a pending petition in bankruptcy, is not operating as a debtor in possession, and has not filed a petition in bankruptcy within the preceding 5 years, nor has Carnegie Mellon had a petition in bankruptcy filed against it within the preceding 5 years that resulted in re-organization under Chapter 11 of the United States Bankruptcy Code.

The State of California established the Student Tuition Recovery Fund (STRF) to relieve or mitigate economic loss suffered by a student in an educational program at a qualifying institution, who is or was a California resident while enrolled, or was enrolled in a residency program, if the student enrolled in the institution, prepaid tuition, and suffered an economic loss. Unless relieved of the obligation to do so, you must pay the state-imposed assessment for the STRF, or it must be paid on your behalf, if you are a student in an educational program, who is a California resident, or are enrolled in a residency program, and prepay all or part of your tuition.

You are not eligible for protection from the STRF and you are not required to pay the STRF assessment, if you are not a California resident, or are not enrolled in a residency program.

It is important that you keep copies of your enrollment agreement, financial aid documents, receipts, or any other information that documents the amount paid to the school. Questions regarding the STRF may be directed to the Bureau for Private Postsecondary Education, 1747 North Market Blvd, Suite 225, Sacramento, CA 95834, (916) 574-8900 or (888) 370-7589.

To be eligible for STRF, you must be a California resident or are enrolled in a residency program, prepaid tuition, paid or deemed to have paid the STRF assessment, and suffered an economic loss as a result of any of the following:

1. The institution, a location of the institution, or an educational program offered by the institution was closed or discontinued, and you did not choose to participate in a teach-out plan approved by the Bureau or did not complete a chosen teach-out plan approved by the Bureau.
2. You were enrolled at an institution or a location of the institution within the 120 day period before the closure of the institution or location of the institution, or were enrolled in an educational program within the 120 day period before the program was discontinued.
3. You were enrolled at an institution or a location of the institution more than 120 days before the closure of the institution or location of the institution, in an educational program



offered by the institution as to which the Bureau determined there was a significant decline in the quality or value of the program more than 120 days before closure.

4. The institution has been ordered to pay a refund by the Bureau but has failed to do so.
5. The institution has failed to pay or reimburse loan proceeds under a federal student loan program as required by law, or has failed to pay or reimburse proceeds received by the institution in excess of tuition and other costs.
6. You have been awarded restitution, a refund, or other monetary award by an arbitrator or court, based on a violation of this chapter by an institution or representative of an institution, but have been unable to collect the award from the institution.
7. You sought legal counsel that resulted in the cancellation of one or more of your student loans and have an invoice for services rendered and evidence of the cancellation of the student loan or loans.

To qualify for STRF reimbursement, the application must be received within four (4) years from the date of the action or event that made the student eligible for recovery from STRF.

A student whose loan is revived by a loan holder or debt collector after a period of noncollection may, at any time, file a written application for recovery from STRF for the debt that would have otherwise been eligible for recovery. If it has been more than four (4) years since the action or event that made the student eligible, the student must have filed a written application for recovery within the original four (4) year period, unless the period has been extended by another act of law.

However, no claim can be paid to any student without a social security number or a taxpayer identification number.

**NOTICE CONCERNING TRANSFERABILITY OF CREDITS AND CREDENTIALS EARNED AT OUR INSTITUTION** The transferability of credits you earn at Carnegie Mellon University is at the complete discretion of an institution to which you may seek to transfer. Acceptance of the M.S. degree you earn in Electrical and Computer Engineering or Software Engineering is also at the complete discretion of the institution to which you may seek to transfer. If the credits or degree that you earn at this institution are not accepted at the institution to which you seek to transfer, you may be required to repeat some or all of your coursework at that institution. For this reason you should make certain that your attendance at this institution will meet your educational goals. This may include contacting an institution to which you may seek to transfer after attending Carnegie Mellon University to determine if your credits or degree will transfer.

Meeting the cost of a graduate education is a significant investment. Carnegie Mellon University is committed to making it financially possible for graduate students to enhance educational development and reach their career goals. There are many financial aid resources available to students pursuing graduate studies at Carnegie Mellon University. Carnegie Mellon University participates in a number of Federal and state financial aid programs. Information about these financial aid programs can be found on Carnegie Mellon University's website, at <http://www.cmu.edu/finaid/index.html>.

Carnegie Mellon University is accredited through a voluntary, peer-review process coordinated by the Middle States Commission on Higher Education (MSCHE or Middle States). MSCHE is one of six regional accrediting agencies in the United States, each accrediting institutions of higher

education within a specific geographic region. Middle States is recognized by the U.S. Department of Education. This recognition enables MSCHE's member institutions to establish eligibility to participate in federal financial aid programs (e.g., federal loans, grants, and work-study) administered by the U.S. Department of Education. Carnegie Mellon University has been accredited by Middle States since 1921.

Please visit <http://www.cmu.edu/middlestates/> to learn more about accreditation standards and processes and to view the University's reaccreditation reports.

The address and telephone number for the Middle States Commission on Higher Education is 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104, (267) 284-5000.

### **Office of Student Assistance and Relief**

The Office of Student Assistance and Relief is available to support prospective students, current students, or past students of private postsecondary educational institutions in making informed decisions, understanding their rights, and navigating available services and relief options. The office may be reached by calling (888) 370-7589, option #5, or by visiting [osar.bppe.gov](http://osar.bppe.gov)

## **APPENDIX C: LIST OF PROGRAM COURSES**

### **Entrepreneurship and Innovation in Technology (18-601) – 12 Units**

Have an idea you want to bring to the world? Ever want to start a company?? Do you wonder what it takes to be an entrepreneur? Then this is the class for you. Entrepreneurship and Innovation in Technology is an introductory course in entrepreneurship for graduate students. The course targets non-business students and assumes no background in business. Students are exposed to fundamental concepts and issues around innovation and entrepreneurship. The course provides a foundation for starting a new venture and innovating new technologies and products within existing organizations. Topics covered will include: identifying a business opportunity, acquiring customers, building a team, developing a business model, understanding investment, managing risk, and achieving differentiation. Emphasis will be on team projects, including developing an investor pitch for an original idea.

### **Fundamentals of Modern CMOS Devices (18-610) – 12 Units**

This course is intended to provide a foundation in device operation for circuit designers working in today's sub-micron CMOS. This course will also provide advanced understanding of CMOS technology for those interested in integrated circuit process technology and device physics. We review semiconductor device physics, including carrier dynamics and the basic equations of semiconductor device physics. The operation of the p-n junction diode is also reviewed. The course includes a description of integrated circuit fabrication technology and how it is used to fabricate CMOS devices. With this foundation, we then discuss the MOS capacitor (including its application as a varactor). The theory of the MOS transistor will then be developed, followed by

a discussion of important phenomena in sub-micron devices such as: velocity saturation; breakdown; drain-induced barrier lowering; random dopant fluctuations, etc. The student will learn the relationship between device geometry, e.g. length, and fabrication, e.g. doping, and the corresponding circuit performance. The course will primarily be lecture-based, with some selected simulation exercises. Students are expected to be acquainted with the basic concepts of electrical circuits; electromagnetic fields at the level of a sophomore level physics course, and to have adequate preparation in mathematics (basic differential equations and MATLAB or similar applications). Prior coursework in device physics is helpful but not required for graduate students. Lecture: 4 hrs

### **Neural Technology: Sensing and Stimulation (18-612) – 12 Units**

This course gives engineering insight into the operation of excitable cells, as well as circuitry for sensing and stimulation nerves. Initial background topics include diffusion, osmosis, drift, and mediated transport, culminating in the Nernst equation of cell potential. We will then explore models of the nerve, including electrical circuit models and the Hodgkin-Huxley mathematical model. Finally, we will explore aspects of inducing a nerve to fire artificially, and cover circuit topologies for sensing action potentials and for stimulating nerves. If time allows, we will discuss other aspects of medical device design. Students will complete a neural stimulator or sensor design project. Although students in 18-612 will share lectures and recitations with students in 18-412, students in 18-612 will receive distinct homework assignments, distinct design problems, and distinct exams from the ones given to students in 18-412 and will be graded on a separate curve from students taking 18-412.

### **Foundations of Computer Systems (18-613) – 12 Units**

This course provides a programmer's view of how computer systems execute programs, store information, and communicate. It enables students to become more effective programmers, especially in dealing with issues of performance, portability and robustness. It also serves as a foundation for courses on compilers, networks, operating systems, and computer architecture, where a deeper understanding of systems-level issues is required. Topics covered include: machine-level code and its generation by optimizing compilers, performance evaluation and optimization, computer arithmetic, processor architecture, memory organization and management, networking technology and protocols, and supporting concurrent computation. This course is modeled after 15-213/18-213/15-513, and is intended for ECE MS students with expanded course contents presented at the graduate level. It prepares students for other graduate level computer systems courses as well as working in the industry. Anti-requisites: 15213, 18213, 15513

### **Microelectromechanical Systems (18-614) – 12 Units**

This course introduces fabrication and design fundamentals for Microelectromechanical Systems (MEMS): on-chip sensor and actuator systems having micron-scale dimensions. Basic principles covered include microstructure fabrication, mechanics of silicon and thin-film materials, electrostatic force, capacitive motion detection, fluidic damping, piezoelectricity, piezoresistivity, and thermal micromechanics. Applications covered include pressure sensors, micromirror

displays, accelerometers, and gas microsensors. Grades are based on exams and homework assignments. 4 hrs. lec.

### **Micro and Nano Systems Fabrication (18-615) – 12 Units**

This is a new course intended to introduce students to the process flow and design methodology for integrated systems fabrication. The course will present this material through two paths. Lectures will be presented on the basic unit processes of micro and nanosystems fabrication: deposition, patterning, and etching. Lectures will draw on examples from: Semiconductor device fabrication; Microelectromechanical systems (MEMS) fabrication; Magnetic device fabrication; and Optical device fabrication. Problem sets will be given based on this lecture material to allow students to quantitatively analyze certain process steps in detail. The second path for material presentation will be through a series of labs that allow students to design, fabricate and test an integrated device. These laboratories will be scheduled at regular meeting times, and will use research facilities within the ECE department. This is a PhD level course. MS or senior students must obtain permission from the instructor to be registered.

### **Nano-Bio-Photonics (18-616) – 12 Units**

Light can penetrate biological tissues non-invasively. Most of the available bio-optic tools are bulky. With the advent of novel nanotechnologies, building on-chip integrated photonic devices for applications such as sensing, imaging, neural stimulation, and monitoring is now a possibility. These devices can be embedded in portable electronic devices such as cell phones for point of care diagnostics. This course is designed to convey the concepts of nano-bio-photonics in a practical way to prepare students to engage in emerging photonic technologies. The course starts with a review of electrodynamics of lightwaves. The appropriate choice of wavelength and material platform is the next topic. Then optical waveguides and resonators are discussed. Resonance-based sensing is introduced followed by a discussion of the Figure of Merits (FOMs) used to design on-chip sensors. Silicon photonics is introduced as an example of a CMOS-compatible platform. On-chip spectroscopy is the next topic. The second part covers nano-plasmonics for bio-detection and therapy. The design methods are discussed, followed by an overview of nanofabrication and chemical synthesis, and then a discussion of applications. The last part of this course will be dedicated to a review of recent applications such as Optogenetic neural stimulation, Calcium imaging, Cancer Imaging and Therapy. Senior or graduate standing required. This course is cross-listed with 18416. Although students in 18-616 and 18-416 will share the same lectures and recitations, students in 18-616 will receive distinct course projects. Students in 18-416 and 18-616 will be graded on separate curves.

### **Smart Grids and Future Electric Energy Systems (18-618) – 12 Units**

The course offers an advanced presentation of modern electric power systems, starting from a brief review of their structure and their physical components, through modeling, analysis, computation, sensing and control concepts. Great care is taken to avoid presenting "practical" techniques built on dubious theoretical foundations and also to avoid building elaborate "mathematical" models whose physical validity and relevance may be questionable. Mastering both principles and relevant models is important for those who wish to seriously understand how today's electric power grids work and their challenging technical issues. This prepares students

for working on applying many novel information processing concepts for designing and operating more reliable, secure, and efficient electric energy systems. Students interested in both applied physics and signals and systems should consider taking this subject. Once the fundamentals of today's power systems are understood, it becomes possible to consider the role of smart electric power grids in enabling evolution of future electric energy systems. Integration of intermittent energy resources into the existing grid by deploying distributed sensors and actuators at the key locations throughout the system (network, energy sources, consumers) and changes in today's Supervisory Control and Data Acquisition (SCADA) for better performance become well-posed problems of modeling, sensing and controlling complex dynamic systems. This opens opportunities to many innovations toward advanced sensing and actuation for enabling better physical performance. Modeling, sensing and control fundamentals for possible next generation SCADA in support of highly distributed operations and design are presented. Prior knowledge in 18-418 or 18-771 is highly recommended.

### **Digital Integrated Circuit Design (18-622) – 12 Units**

This course covers the design and implementation of digital circuits in a modern VLSI process technology. Topics will include logic gate design, functional unit design, latch/flip-flop design, system clocking, memory design, clock distribution, power supply distribution, design for test, and design for manufacturing. The lab component of the course will focus on using modern computer aided design (CAD) software to design, simulate, and lay out digital circuits. The final project for the course involves the design and implementation to the layout level of a small microprocessor. 18-240 and 18-320 or equivalent background material with permission of the instructor. Although students in 18-422 and 18-622 will share lectures, labs, and recitations, students in 18-422 and 18-622 will receive different homework assignments, design projects, and exams, and in some cases 18-622 students will also have different or additional lab sessions.

### **Analog Integrated Circuit Design (18-623) – 12 Units**

Some form of analog circuit design is a critical step in the creation of every modern IC. First and foremost, analog circuits act as the interface between digital systems and the real world. They act to amplify and filter analog signals, and to convert signals from analog to digital and back again. In addition, high performance digital cell design (either high speed or low power) also invokes significant analog circuit design issues. The goal of this course is to teach students some of the methods used in the design and analysis of analog integrated circuits, to illustrate how one approaches design problems in general, and to expose students to a broad cross-section of important analog circuit topologies. The course will focus on learning design through carrying out design projects. Design and implementation details of wide-band amplifiers, operational amplifiers, filters and basic data converters will be covered. Example topics to be covered include transistor large- and small-signal device models, small-signal characteristics of transistor-based amplifiers, large-signal amplifier characteristics and nonidealities, operational amplifier design, basic feedback amplifier stability analysis and compensation, and comparator design. The course will focus primarily on analog CMOS, but some aspects of BJT design will be discussed. 18-290 and 18-320 or equivalent background material with permission of the instructor. Although

students in 18-623 will share Lectures and Recitations with students in 18-421, students in 18-623 will receive distinct homework assignments, distinct design problems, and distinct exams from the ones given to students in 18-421 and will be graded on a separate curve from students taking 18-421.

### **ULSI Mobile Platform and Server Product Design (18-625) – 12 Units**

The objective of this class is to design an ULSI (Ultra Large Scale Integrated) mobile platform and a server product in two scenarios: System on Chip (SoC) and System in Package (SiP). State-of-the-art 2016 technology nodes (28nm, 20nm or 14nm) will be assumed for the SoC scenario and full 3-D integration with Through Silicon Vias (TSV) will be pursued for the 2020 SiP scenario. Students will be given all the necessary technology data (device performance, interconnect parasitics, wafer and TSV/packaging costs, and also the expected yield data). The design objective is to deliver a product competitive to the leading products available on the market or anticipated in 5 years. The complete product design will be carried out focusing on the processor cores, graphics and the embedded memories (including new generation memories in the 2020 scenarios). System performance and power will be estimated using provided simulators for specified benchmarks. The goal is to minimize the product cost by maximizing the number of good die per wafer while achieving competitive product performance and power objectives. Prerequisites: 18664 or instructor permission

### **Introduction to Information Security (18-631) – 12 Units**

Our growing reliance on information systems for daily activities, ranging from remote communications to financial exchanges, has made information security a central issue of our critical infrastructure. The course introduces the technical and policy foundations of information security. The main objective of the course is to enable students to reason about information systems from a security engineering perspective, taking into account technical, economic and policy factors. Topics covered in the course include elementary cryptography; access control; common software vulnerabilities; common network vulnerabilities; policy and export control laws, in the U.S., Japan, and elsewhere; privacy; management and assurance; economics of security; and special topics in information security. Prerequisites: The course assumes a basic working knowledge of computers, networks, C and UNIX programming, as well as an elementary mathematics background, but does not assume any prior exposure to topics in computer or communications security. Students lacking technical background (e.g., students without any prior exposure to programming) are expected to catch up through self-study.

### **Introduction to Hardware Security (18-632) – 12 Units**

This course covers basic concepts in the security of hardware systems. Topics covered include active and passive attacks, reverse engineering, counterfeiting, and design of hardware security primitives (e.g., random number generators, physical unclonable functions, crypto-processors). Lab sessions will give students hands on experience with performing attacks, developing countermeasures, and implementing secure hardware building blocks. Students are expected to have basic knowledge of digital logic and Register-Transfer Level (RTL) design, but no specific background in security/cryptography is necessary.

### **Browser Security (18-636) – 12 Units**

The Web continues to grow in popularity as platform for retail transactions, financial services, and rapidly evolving forms of communication. It is becoming an increasingly attractive target for attackers who wish to compromise users' systems or steal data from other sites. Browser vendors must stay ahead of these attacks by providing features that support secure web applications. This course will study vulnerabilities in existing web browsers and the applications they render, as well as new technologies that enable web applications that were never before possible. The material will be largely based on current research problems, and students will be expected to criticize and improve existing defenses. Topics of study include (but are not limited to) browser encryption, JavaScript security, plug-in security, sandboxing, web mashups, and authentication. The course will involve an intensive group research project focusing on protocols/algorithms, vulnerabilities, and attacks as well as several individual homework and programming tasks. Groups will perform a sequence of cumulative tasks (literature review, analysis, simulation, design, implementation) to address aspects of their chosen topic, occasionally reporting their results to the class through brief presentations, leading to a final report.

### **Wireless Security (18-637) – 12 Units**

With the surge of mobile device use, embedded system deployment, and development of always-connected devices, the underlying wireless communication and network systems are becoming more critical for everyday use. Even though security and privacy have emerged as important focus areas for modern technology, the wireless links that connect our pervasive devices are still less understood from the perspectives of security and privacy than other system aspects. This course will focus on the challenges in providing secure communication and network services in a variety of wireless systems and current and past approaches to manage these challenges. Topic coverage will include vulnerabilities, attacks, security mechanisms, and trade-offs at various layers of the network protocol stack, from aspects of physical communication to application and service security issues; examples include jamming, MAC-layer misbehavior, selective packet dropping, decentralized trust and reputation, and cross-layer holistic attacks. Systems of interest include (but are not limited to) personal devices, connected vehicles, embedded and IoT systems, wireless infrastructure, and ad hoc networks. Class material will be largely based on recent and current research. In addition to individual homework assignments, students will participate in an intensive group project involving significant research, development, and experimentation. Graduate standing is required to register for this course.

### **Mobile and IoT Security (18-638) – 12 Units**

For many people, mobile and embedded devices have become an essential part of life and work. As such devices represent many and varied combinations of technologies, they have unique security and privacy issues that potentially impact users, developers, service providers, manufacturers, and regulators. This course will focus on various aspects of security and privacy that are faced by mobile and Internet of Things devices, including aspects of wireless communication and networking, mobile computing, data analytics, security, and privacy. The course will include studies of security and privacy aspects of networking (including telecom, enterprise, personal, etc.), applications, and data analytics as relevant to mobile and embedded/IoT devices. One of the main goals of the course is to improve knowledge and

awareness of security issues faced by mobile application developers, embedded system builders, and smart system designers. Material will cover standards, best practices, and research challenges in both deployed and emerging systems. Topics of study include (but are not limited to) telecom protocols and vulnerabilities; mobile/IoT network security; security and privacy in edge computing; mobile application security; and location and activity privacy. In addition to individual homework assignments, students will participate in an intensive group project involving significant research, development, and experimentation. Graduate standing is required to register for this course.

### **Policies of the Internet (18-639) – 12 Units**

This course will address public policy issues related to the Internet. This may include policy issues such as network neutrality and the open Internet, Internet governance and the domain name system (and the role of the United Nations), copyright protection of online content, regulation of indecency and pornography, universal access to Internet and Internet as a "human right," government surveillance of the Internet, Internet privacy and security, and taxation of electronic commerce. It will also teach some fundamentals of Internet technology. Because these are inherently interdisciplinary issues, the course will include detailed discussions of technology, economics, and law, with no prerequisites in any of these areas. Senior or graduate standing required.

### **Hardware Arithmetic for Machine Learning (18-640) – 12 Units**

In this course, students explore the techniques for designing high-performance digital circuits for computation along with methods for evaluating their characteristics. We begin by reviewing number systems and digital arithmetic along with basic arithmetic circuits such as ripple-carry adders. From there, we move to more complex adders (carry-look-ahead, carry-skip, carry-bypass, etc.), multipliers, dividers, and floating-point units. For each circuit introduced, we will develop techniques and present theory for evaluating their functionality and speed. Other methods will be described for analyzing a circuit's power consumption, testability, silicon area requirements, correctness, and cost. In addition, we will utilize various CAD tools to evaluate the circuits described. Finally, advanced timing and clocking concepts will be investigated. For example, the notion of clock skew will be introduced and its impact on clock period for sequential circuits will be analyzed. We will also learn how to analyze and design asynchronous circuits, a class of sequential circuits that do not utilize a clock signal. Course projects focus on key arithmetic aspects of various machine learning algorithms including: K-nearest neighbors, neural networks, decision trees, and support vector machines.

\*Note: Although students in 18-340 and 18-640 will share lectures, labs, and recitations, students in 18-340 and 18-640 will receive different homework assignments, design projects, and exams. In some cases 18-640 students will also have different or additional lab sessions. The homework assignments, design projects, and exams that are given to the students registered for 18-640 will be more challenging than those given to the students registered for 18-340 in that they will have more complex designs, involve additional theoretical analysis, and have more stringent specifications (e.g., in area, power, performance, and robustness).



### **Design Patterns for Smartphone Development (18-641) – 12 Units**

This course provides an intensive exploration of computer programming by reviewing the basics of Object-Oriented programming and moving quickly to advanced programming using design patterns and a multi-tiered architecture. As part of the course work, students will learn smartphone development and how to apply the learned programming techniques to create extensible, reusable and quality software. It is intended for master's students who have had some prior, but perhaps limited, programming experience in Java or another object-oriented programming language; it is not intended as a first course in programming.

### **Embedded System Software Engineering (18-642) – 12 Units**

In a very real sense, embedded software is what makes our everyday world function. From self-driving cars to chemical processing plant equipment, and from medical devices to the electric grid, embedded software is everywhere. You already know how to write code for a microcontroller. Now, learn software quality, safety, and security skills that are required to make embedded systems that can handle the messiness of the real world. This course provides in-depth coverage of the topics that are essential to the success of embedded software projects based on case studies of industry project teams that have suffered or failed. Students will learn about a variety of topics including: lightweight but high quality embedded software processes, technical best practices for embedded software, effective testing and validation, causes of software system failures, software for safety-critical systems, and embedded-specific aspects of software security. The material will generally be broken up into a set of four related topics each week, with one assignment per topic weekly, involving a combination of programming assignments, tool use experiences, and research questions to get hands-on experience at dealing with the types of problems that are encountered in industry embedded projects. We assume you already know how to code in C and understand the basics of microcontrollers. This course is about getting you ready to build industry-strength embedded projects. Undergraduate students are required to take 18349 prior to enrolling in this course. Graduate students are strongly encouraged to take 18-600/15-213/15-513/18-213 before or concurrently with this course.

### **Reconfigurable Logic: Technology, Architecture and Applications (18-643) – 12 Units**

Three decades since its original inception as a lower-cost compromise to ASIC, modern Field Programmable Gate Arrays (FPGAs) are versatile and powerful systems-on-a-chip for many applications that need both hardware level efficiency and the flexibility of reprogrammability. More recently, FPGAs have also emerged as a formidable computing substrate with applications ranging from data centers and mobile devices. This course offers a comprehensive coverage of modern FPGAs in terms of technology, architecture and applications. The coverage will also extend into on-going research investigations of future directions. Students will take part in a substantial design projects applying the latest FPGA platforms to compute acceleration. Register-Transfer Level (RTL) hardware design experience is required.

### **Special Topics in Computer Systems (18-644) – 12 Units**

This course covers applications of mobile hardware systems and the hardware associated with these systems. The course enables students 1) to analyze the implications of mobile hardware capabilities and restrictions in order to plan and develop mobile applications, 2) to propose and

justify new ideas in the mobile space, and 3) to expose students to a range of mobile systems. Students will be able to devise and interface simple hardware additions to enable new applications. The course covers the elements of embedded systems development, such as hardware fundamentals, system development, as well mobile topics such as power management, machine-to-machine communication, and applications. Student teams will undertake small HW/SW interfacing projects on Arduino to sharpen their experience, and shape and build a novel application with the faculty. Unlike a conventional hardware course, the course would instead focus on the system and software implications, rather than the hardware components (i.e. CPU and radio). Prerequisites: Some understanding of basic electrical terminology; Java programming and C programming desired

### **How to Write Fast Code (18-645) – 12 Units**

The fast evolution and increasing complexity of computing platforms pose a major challenge for developers of high performance software for engineering, science, and consumer applications: it becomes increasingly harder to harness the available computing power. Straightforward implementations may lose as much as one or two orders of magnitude in performance. On the other hand, creating optimal implementations requires the developer to have an understanding of algorithms, capabilities and limitations of compilers, and the target platform's architecture and microarchitecture. This interdisciplinary course introduces the student to the foundations and state-of-the-art techniques in high performance software development using important functionality such as linear algebra kernels, transforms, filters, and others as examples. The course will explain how to optimize for the memory hierarchy, take advantage of special instruction sets, and how to write parallel code for multicore, manycore, and cluster platforms, based on state-of-the-art research. Further, a general strategy for performance analysis and optimization is introduced that the students will apply in group projects that accompany the course. Finally, the course will introduce the students to the recent field of automatic performance tuning. Prerequisite: Senior ECE or CS undergraduate student or higher, solid C programming skills.

### **Low-Power System-on-Chip Architecture (18-646) – 12 Units**

This course provides the architectural foundations for low-power systems out of which sensors, low power embedded systems, internet of things devices and the like are created. It includes microarchitecture, energy-aware programming, energy harvesting, energy management, and real-time measurement and abstraction of energy usage at runtime. As a part of the course, we will naturally build embedded systems at a level where energy usage can be measured and controlled.

### **Embedded Real-Time Systems (18-648) – 12 Units**

Real-time embedded systems pervade many aspects of modern life ranging from household appliances, transportation and motion control systems, medical systems and devices, robotics, multimedia and mobile communications, video-games, energy generation/distribution/management, to aerospace and defense systems. This course has three complementary goals. One, it will cover the core concepts and principles underlying these systems, including resource management, scheduling, dependability and safety. Implications to

multi-core platforms, SoCs, networks and communication buses will also be discussed. Mathematical models and analysis techniques will be presented. Two, the course will offer hands-on experience with implementing real-time embedded systems on realistic platforms. This will be facilitated by detailed discussions of hardware-software interfaces, concurrency and communications. Finally, application-level concepts such as signal processing, image processing, computer vision, sensor fusion and feedback control will complete an overview of the breadth and depth of real-time embedded systems. Knowledge of the C programming language, basic computer architecture and an assembly language will be assumed.

### **Distributed Embedded Systems (18-649) – 12 Units**

Embedded computers seem to be everywhere, and are increasingly used in applications as diverse as transportation, medical equipment, industrial controls, and consumer products. This course covers how to design and analyze distributed embedded systems, which typically consist of multiple processors on a local area network performing real time control tasks. The topics covered will include issues such as communication protocols, synchronization, real-time operation, fault tolerance, distributed I/O, design validation, and industrial implementation concerns. The emphasis will be on areas that are specific to embedded distributed systems as opposed to general-purpose networked workstation applications. This course assumes that students already know fundamental topics such as interrupts, basic I/O, and uniprocessor scheduling that are commonly taught in introduction-level embedded system courses such as 18-348 and 18-349. Any graduate student who has not taken one of the pre-requisite is responsible for understanding relevant material necessary for this course. Additionally, all students are responsible for knowing or learning on their own intermediate-level programming in Java. Prerequisites: 18348 or 18349 and senior or graduate standing.

### **Policies of Wireless Systems (18-650) – 12 Units**

This course will address public policy issues related to wireless systems. It investigates policies related to a wide variety of emerging wireless systems and technologies, including current and next-generation cellular systems, wifi and white space devices, emerging methods of accessing spectrum, communications systems for emergency responders (firefighters, police, emergency medical services), current and next-generation television, and satellite communications. This can include the government role in facilitating the creation of infrastructure, in advancing competition among broadcasters and communications service providers, in using scarce spectrum efficiently, in promoting public safety and homeland security, and in protecting privacy and security. Because these are inherently interdisciplinary issues, the course will include detailed discussions of technology, economics, and law, with no prerequisites in any of these areas. This course is cross-listed as 18-650, 19-403, 19-713, and 95-824. Senior or graduate standing required.

### **Networked Cyber-Physical Systems (18-651) – 12 Units**

Cyber-physical systems (CPS) represent a new class of systems that bring together sensing, computation, communication, control and actuation to enable continuous interactions with physical processes. This integration of networked devices, people, and physical systems provides huge opportunities and countless applications in biology and healthcare, automotive and

transportation, power grids and smart buildings, social and financial markets, etc. Hence, CPS need to provide real-time efficiency, adaptability, optimality, security and robustness to natural disasters or targeted attacks. While the focus on embedded systems relies on building computational models for specific applications, CPS need a multidisciplinary approach and a more general computational paradigm such that more-direct interactions between the system and physical world become possible. This course is primarily an in-depth introduction to networked CPS with an emphasis on methods for modeling, design, and optimization. Focus is on the dominant design paradigms like low-power and communication-centric design. Topics to be covered include: physical processes, models of concurrency, sensing and workload modeling, human behavior modeling, data-driven modeling, networking at micro- and macro-scale, system-wide resources management, programming, validation and integration. From a practical standpoint, students will directly experiment with hardware prototypes and software tools to explore concrete CPS examples. By structure and contents, this class is primarily targeted to ECE students; it can also provide a valuable basis for interdisciplinary research to students in CS and related disciplines.

### **Foundations of Software Engineering (18-652) – 12 Units**

In this course, you will learn about software engineering paradigms that have shaped the software industry over the past few decades. You will be exposed to fundamental disciplines of software engineering as well as engineering practices that crosscut system, project, and user perspectives. You will learn to iteratively define requirements, and architect, design, implement, integrate, test, and deploy a solution. You will work on self-organizing teams and manage the work collaboratively. You will also learn to solve a real problem subject to multiple constraints while keeping the stakeholders involved throughout the lifecycle and balancing the underlying engineering tradeoffs. The topics are applied in the context of a semester-long group project. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the "Software Engineering and Design" course area requirement. Prerequisites: Basic software development experience with proficiency in at least one modern programming language and modern programming concepts. Prior to admission, students must successfully complete a programming assignment to demonstrate familiarity with required software technologies. Students who have successfully completed 18-652, Foundations in Software Engineering, are not eligible to take this course.

### **Software Architecture and Design (18-653) – 12 Units**

Software Architecture and Design is a one-semester course, aiming to train our graduate students from software engineers toward becoming a Software Architect, who is the "Technical Lead" of a software project team. The primary objective of the course is to help students develop skills in designing, developing, and justifying reasonable software architecture for enterprise-scale software-intensive systems, considering both functional and non-functional requirements as well as contextual system environments. Core topics include: overview of software architecture, micro architectural patterns (so-called design patterns) and macro architectural patterns (i.e., modern patterns), service oriented architecture, architectural modeling, viewpoints and perspectives, architectural analysis techniques, architectural tactics (QoS), agile architecture, and some advanced topics. Literature survey and study of state-of-the-art technologies, as well as

both individual and group project work, are essential ingredients of this class. Research and practical projects build upon one another. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the Software Engineering and Design requirement. Anti-requisites: 17-655 from CS Dept. Pre-requisites: 18-652

### **Software Verification and Testing (18-654) – 12 Units**

Verification and testing (V&T) support software engineers and development teams in their endeavor to build dependable systems. These interrelated activities form the backbone of a high-quality software solution that performs its function as intended. V&T is no longer considered an exclusively backend phase undertaken by a separate quality assurance unit, vulnerable to availability of discretionary resources near project end. Rather, V&T is a cross-functional discipline applied throughout the software lifecycle from beginning to end. As such V&T is an integral and essential part of any sensible software development process. This course introduces the students to concepts, principles, theory, types, tools, and techniques of V&T with exposure to both modern, widely-applicable approaches and traditional, formal techniques. Students will acquire sufficient depth and breadth in V&T through a balanced coverage of topics. The course syllabus spans fundamentals such as V&T principles, systematic testing, input space analysis, and test coverage; practical strategies such as test-driven development, unit testing, and test design; and formal approaches such as abstraction, model checking, static analysis, and symbolic execution. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the "Analysis" area core course requirement. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the Analysis area core course requirement.

### **Service Oriented Computing (18-655) – 12 Units**

Service Oriented Computing (SOC) is a one-semester course that introduces how to build and leverage software systems as a service to facilitate reusability, scalability, availability, and interoperability, in a networked environment. SOC has been significantly changing the way how software systems and applications are analyzed, architected, designed, implemented, tested, evaluated, delivered, consumed, maintained and evolved. Its comprising techniques have enabled the emergence of the contemporary third-generation software engineering: Service Oriented Software Engineering (SOSE). In this course, key concepts and standards, core enabling technologies and innovative consulting methods, as well as major solution patterns, are captured in the whole lifecycle of SOSE. Research and practical projects build upon one another. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the "Software Engineering and Design" area requirement. Prerequisites: Proficiency with either Java or Python programming language and in modern software development concepts.

### **Data Intensive Workflow Development for Software Engineers (18-656) – 12 Units**

Many software systems nowadays have become increasingly data intensive and data centered applications. Manipulating comprehensive datasets and heterogeneous data sources typically requires composing and executing a series of computational or data manipulation steps, called a workflow. A data-oriented workflow is a formal way of defining, automating, repeating and

adapting multi-step computational procedures driven by data events. The primary objective of the course is to help students develop skills in engineering data-oriented workflows, in the context of service-oriented software engineering, big data, cloud computing, Internet of Things, social networking, and mobile computing. Core topics include: data-oriented workflow theory, models, languages, techniques, architectures, systems, tools; workflow discovery, reuse, recommendation, orchestrations and choreographies; workflow properties and data dependencies; data provenance capture, storage, retrieval, and mining; workflow execution, allocation, and optimization on cloud; workflow as a service, as well as collaborative data analytics on the Internet. Literature survey and study of state-of-the-art technologies, as well as both individual and group project work, are essential ingredients of this class. Research and practical projects build upon one another. Please note that this course is intended for ECE master students with a concentration in Software Engineering and will satisfy the Systems area requirement.

### **Decision Analysis and Engineering Economics for Software Engineers (18-657) – 12 Units**

Engineering software systems entails continuously making resource and technical decisions at multiple levels subject to different sources of uncertainty, cost-benefit tradeoffs, historical data, and flexibility demands. This course will develop quantitative and modeling skills for economics-based and decision-theoretic reasoning in software engineering through a repertoire of techniques from several fields. Special consideration will be given to reasoning under uncertainty and empirical approaches to tackle a variety of software engineering decision-making problems, including technology, architecture, design, product, and process decisions. The analysis techniques covered will be illustrated through domain-specific examples. Analysis techniques that will be covered include Monte Carlo Simulation, Net Present Value, Expected Value of Information, Decision Tree Analysis, Real Options Theory, Utility Theory, and Analytic Hierarchy Process. Basic data analysis concepts, including descriptives, linear regression, correlation, and hypothesis testing will be explained and used. Examples and fully-developed case studies will illustrate how these techniques can be combined to best leverage their strengths. The course has a practical focus, but includes coverage of the necessary background theories. Orientation is distinctly quantitative. Knowledge of basic probability is required. Pre-requisites: 18-652 (can be taken concurrently)

### **Software Requirements and Interaction Design (18-658) – 12 Units**

Good software systems should be engineered with user experience in mind. How can we design software systems that are at once useful, usable, and enjoyable to use?

This course addresses these challenges by integrating two disciplines: requirements engineering and interaction design. Students learn to combine user research, design-based ideation and validation, and requirements definition, within an agile software development process.

Students apply this knowledge during a semester-long project. Their goal is to envision and implement the first version of an innovative software system that could make a unique contribution to society. The system should address a real problem, satisfy real stakeholders' needs, and provide a superior user experience. Students collaborate closely with their stakeholders throughout the project for needs elicitation, design concepts validation, and usability testing.

This course is intended for ECE master students with a concentration in Software Engineering. It is a core course of the MS-SE program satisfying the "Software Engineering and Design" course area requirement.

### **Software Engineering Methods (18-659) – 12 Units**

There has been a rapid evolution of software engineering development methods over the past decades. From Waterfall to Iterative and Incremental, to Agile and Lean, we have witnessed waves of new methods, each adding significant value to the field. However, the plethora of available methods poses a challenge for software practitioners: Which method should be adopted on a specific software project? Software Engineering Methods addresses this challenge by introducing students to emerging approaches for developing software-intensive systems. Given the vast spectrum of software development endeavors, these approaches aim at defining custom hybrid methods by focusing on software development principles and practices together with their applicability to specific project contexts. Students learn to analyze the context of a software project and recommend a custom hybrid development method that satisfies the project's specific needs. Students apply this knowledge in the context of a semester-long project where the entire class works together as a team of teams. They define the optimal software development method for their project aimed at evolving an existing software system. They build new system increments by adopting their own method. They monitor their progress and reflect on the effectiveness of their approach and the need for continuous improvement. This course is intended for ECE master students with a concentration in Software Engineering and will satisfy the "Systems" course area requirement. Prerequisites: 18652 or instructor permission

### **Optimization (18-660) – 12 Units**

Many design problems in engineering (e.g., machine learning, finance, circuit design, etc.) involve minimizing (or maximizing) a cost (or reward) function. However, solving these problems analytically is often challenging. Optimization is the study of algorithms and theory for numerically solving such problems, and it underpins many of the technologies we use today. This course is an introduction to optimization. Students will: (1) learn about common classes of optimization problems, (2) study (and implement) algorithms for solving them, and (3) gain hands-on experience with standard optimization tools. We will focus on convex optimization problems, but will also discuss the growing role of non-convex optimization, as well as some more general numerical methods. The course will emphasize connections to real-world applications including machine learning, networking, and finance. The course will involve lectures, homework, exams, and a project.

This course is crosslisted with 18460. Although students in 18460 will share lectures with students in 18660, students in 18460 will receive distinct homework assignments, distinct design problems, and distinct exams from the ones given to students in 18660. Specifically, the homework assignments, design problems and exams that are given to the 18660 students will be more challenging than those given to the 18460 students.

### **Introduction to Machine Learning for Engineers (18-661) – 12 Units**

This course provides an introduction to machine learning with a special focus on engineering applications. The course starts with a mathematical background required for machine learning and covers approaches for supervised learning (linear models, kernel methods, decision trees, neural networks) and unsupervised learning (clustering, dimensionality reduction), as well as theoretical foundations of machine learning (learning theory, optimization). Evaluation will consist of mathematical problem sets and programming projects targeting real-world engineering applications.

### **Hardware Architectures for Machine Learning (18-663) – 12 Units**

Machine learning is poised to change the landscape of computing in more ways than its broad societal applications. Indeed, hardware architectures that can efficiently run machine learning face increasing challenges due to power consumption or run time constraints that technology, platforms, or users impose. This course provides an overview of current advances in hardware architectures that can enable fast and energy efficient machine learning applications from the edge to the cloud. Topics include hardware accelerators, hardware-software co-design, and general or application specific system design and resource management for machine learning applications.

### **ULSI Technology Status and Roadmap for System on Chips and System in Package (18-664) – 12 Units**

This course provides the necessary background for the state-of-the art technologies utilized by the leading edge products covering full spectrum of market drivers from mobile platforms, microprocessors, game chips to the highest performance systems for enterprise solutions computing. We will present all key components of such systems, i.e., logic, analog/RF and embedded memories. Then we present the technology roadmap for the upcoming generations in terms of device architecture options for logic devices (FinFET, Nanowire and Tunnel FET) and memories (Phase Change Memory , Resistive RAM and Magnetic RAM/Spin-Transfer Torque RAM) from the device level all the way to the system level specifications. The last part of the class will be devoted to the system integration issues, namely 3-dimensional integration approaches. This course is designed for MS and PhD students from diverse areas: System/Hardware Design, Circuits and Devices/Nanofabrication and is aimed at bridging the gap among these areas.

### **Analytical Performance Modeling & Design of Computer Systems (18-687) – 12 Units**

In designing computer systems one is usually constrained by certain performance requirements. For example, certain response times or throughput might be required of the system. On the other hand, one often has many choices: One fast disk, or two slow ones? What speed CPU will suffice? Should we invest our money in more buffer space, or a faster processor? Which migration policy will work best? Which task assignment policy will work best? How can we redesign the scheduling policy to improve the system performance? Often answers to these questions are counter-intuitive. Ideally, one would like to have answers to these questions before investing the time and money to build a system. This class will introduce students to analytic stochastic modeling with the aim of answering questions such as those above. Topics covered include Operational



Laws, Markov Chain Theory, Queuing Theory, Modeling Empirical Loads, Simulations, and Management of Server Farms.

### **Introduction to Neuroscience for Engineers (18-690) – 12 Units**

The first half of the course will introduce engineers to the neurosciences from the cellular level to the structure and function of the central nervous system (CNS) vis-à-vis the peripheral nervous system (PNS) and include a study of basic neurophysiology; the second half of the course will review neuroengineering methods and technologies that enable study of and therapeutic solutions for diseases or damage to the CNS. A goal of this course is to provide a taxonomy of neuroengineering technologies for research or clinical application in the neurosciences. This course is cross listed with 42-630

### **Statistical Discovery and Learning (18-697) – 12 Units**

This course is designed to give students a thorough grounding in the methods, theory, mathematics and algorithms needed to do research and applications in machine learning. The topics of the course draw from machine learning, classical statistics, data mining, Bayesian statistics and information theory and other areas. This course is project-oriented and is intended to give students abundant hands-on experience with different machine learning algorithms. Students who have already taken CS 10-701/15-781 Machine Learning should not take this course.

### **Neural Signal Processing (18-698) – 12 Units**

The brain is among the most complex systems ever studied. Underlying the brain's ability to process sensory information and drive motor actions is a network of roughly 10<sup>11</sup> neurons, each making 10<sup>3</sup> connections with other neurons. Modern statistical and machine learning tools are needed to interpret the plethora of neural data being collected, both for (1) furthering our understanding of how the brain works, and (2) designing biomedical devices that interface with the brain. This course will cover a range of statistical methods and their application to neural data analysis. The statistical topics include latent variable models, dynamical systems, point processes, dimensionality reduction, Bayesian inference, and spectral analysis. The neuroscience applications include neural decoding, firing rate estimation, neural system characterization, sensorimotor control, spike sorting, and field potential analysis. Prerequisites: 18-290; 36-217, or equivalent introductory probability theory and random variables course; an introductory linear algebra course; senior or graduate standing. No prior knowledge of neuroscience is needed

### **Technical Writing for Engineers: Linguistic Foundations (18-701) – 6 Units**

Mini 1 (Linguistic Foundations) is designed for engineering students who are preparing for taking Qualifying exams. We will review the structure of Quals that have succeeded and Quals that have been less successful. Students will learn the linguistic foundations of successful overview papers (like those required in Qualifying exams). They will learn the linguistic basis of appropriate citation and the competent elaboration of the work of others. They will learn effective linguistic practices of transitioning from the work of others to their own work and elaborating their own work. They will learn principles of concision, character/action, topical coherence, cohesion, and emphasis, principles that work together to provide the written portion of a Qualifying exam with

an easy flow and readability. They will learn how this system of principles can help them detect gaps in knowledge they will need to fill in by the time of the oral examination, if not in the written portion of the Qual itself. To the greatest extent possible, students will learn to apply these linguistic principles on the written portion of the Quals they are preparing that semester or have prepared in previous semesters. Prerequisites: ECE PhD standing is required.

### **Technical Writing for Engineers: Genre Foundations (18-702) – 6 Units**

Mini 2 (Genre Foundations) is designed for engineering students ready to focus on archival genres that report new knowledge, genres including but not limited to conference papers and journal publications. Students will learn principles of academic novelty and its history in the Royal Society. We will use customized software that give students a "zoomed-in" look at the impressive variety through which introductions establish significance and how they open a "gap" that the author's research was designed to fill. We will overview the important genre features and functions of the various sections of the archival paper. Students are expected to bring to the course archival documents they are currently preparing to submit. Students will use the mini to execute a systematic revision of their document based on the genre functions and features discussed. Prerequisites: ECE PhD standing is required.

### **Managing and Leading Research and Development (18-703) – 12 Units**

This course will provide an insider's look at issues in industrial research and development laboratories that future industrial R&D personnel are likely to face.

The instructor, Prof. Mark Kryder spent nine years as Chief Technical Officer and Senior Vice President, Research for Seagate Technology, the largest disk drive manufacturer in the world. In the course, he will try to give students an improved understanding of how research and development are done in a major high-tech firm today.

The course is built around the instructor's personal experiences, but also draws heavily from business management literature and business case studies. It is expected that the course will make the transition from the university to industry easier and faster for students who have taken it and enable them to become more effective in an industrial setting in a shorter period of time. Examples of issues to be discussed will be the impact of various organizational structures upon R&D; What characteristics are desired in a research staff member vs. a staff development engineer?, What is the importance of diversity in a R&D setting? What are the relative importances of technology, marketing expertise and corporate business models in determining success of a product?; What is meant by "corporate culture" and how does it get defined?; How important are collaboration and teamwork in R&D and are they different?; What is Six Sigma and how important is it in today's business world?; How do you measure performance in R & D?, how do you effectively transfer technology from research to development?; how can you effectively leverage university research and industrial consortia?: How important is intellectual property in various industries? How important is corporate size?: What is the role of technology vision?; What are the effects of globalization on R&D?; What is a technology steering council and how can it be used to facilitate technology transfer and development?

### **Advanced Cloud Computing (18-709) – 12 Units**

Computing in the cloud has emerged as a leading paradigm for cost-effective, scalable, well-managed computing. Users pay for services provided in a broadly shared, power-efficient datacenter, enabling dynamic computing needs to be met without paying for more than needed. Actual machines may be virtualized into machine-like services, abstract programming platforms, or application-specific services, with the cloud infrastructure managing sharing, scheduling, reliability, availability, elasticity, privacy, provisioning and geo-replication.

This course will survey the aspects of cloud computing through about 30 papers and articles, executing cloud computing tasks on a state-of-the-art cloud computing service, and implementing a change or feature in a state-of-the-art cloud computing framework. There will be no final exam, but there will be one or two in-class exams. Grades will be about 50% project work and about 50% examination results.

### **Elements of Photonics for Communication Systems (18-712) – 12 Units**

The aim of this course is to provide students with a basic understanding of the elements of photonics, including the necessary primary devices that form the building blocks of modern optical communication systems. The photon is the fundamental unit particle of light, with frequencies in the range of several hundred Terahertz ( $\sim 100 \times 10^{12}$  Hz). It is a fact of the fundamental theorem of communication that information capacity increases directly with frequency. It is no wonder then that photonic communication systems have become the backbone of modern, ultra-fast and high capacity communication networks. The use of light in communication systems involves the generation, transmission, and detection of photons, along with the encoding (modulation) of signals of interest onto the light carrier wave, and the subsequent decoding (de-modulation) at the destination.

This course begins with an introduction to basic electromagnetic theory (in the frequency range that corresponds to light). The introduction includes Maxwell's equations in both free space and dielectric media. The scalar wave equation derived from the vector Maxwell equations is solved in free space as well as in dielectric media, taking into account the boundary conditions that affect the transmission and reflection of light at the dielectric interfaces. This background is then used in the discussion of the dielectric slab and the related fiber-optic waveguide that is used in the transmission of optical signals in short- and long-haul communication systems.

The course continues with a discussion of semiconductor light generators, with a particular focus on edge-emitting and surface-emitting lasers. Photon detectors—of the semiconductor variety—are then discussed. The course ends with a discussion of other important optical components such as modulators, filters, couplers, multiplexers and demultiplexers. Prerequisites: 18-300 and 18-310 and (18-402 or 33-439) and senior or graduate standing.

### **Physics of Applied Magnetism (18-715) – 12 Units**

In this course we address the physics of magnetism of solids with emphasis on magnetic material properties and phenomena which are useful in various applications. Various applications of magnetism are used to motivate the understanding of the physical properties and phenomena. The content of this course includes the origins of magnetism at the atomic level and the origins

of magnetic ordering (ferro-, ferri-, and antiferro-magnetism), magnetic anisotropy, magnetic domains, domain walls, spin dynamics and electronic transport at the crystalline level. The principles of magnetic crystal symmetry, tensors, and energy minimization are utilized to explore magnetic properties such as resonance, domain structures, magnetocrystalline anisotropy, magnetostriction and magnetoelasticity, and susceptibility. Phenomenological properties, such as the technical magnetization process, are used to describe mechanisms of coercivity, eddy current effects and losses, while energy minimization and relaxation are used to explain properties such as single domain particle behavior, memory mechanisms, magnetic aftereffects and thermal stability. Prerequisite: 18-300 or equivalent background in electromagnetic fields; Senior level solid state physics and materials, or the equivalent, and a senior or graduate student standing.

### **Advanced Analog Integrated Circuits Design (18-721) – 12 Units**

This course will familiarize students with advanced analog integrated circuit design issues. Analog circuit design issues play an important role in creating modern ICs. First and foremost, analog circuits act as the interface between digital systems and the real world. They act to amplify and filter analog signals, and to convert signals from analog to digital and back again. These analog interfaces appear in all communications devices (e.g., cell phones) both to condition the "transmitted" signal and as sensitive "receivers." In addition, these analog interfaces appear in sensors (e.g., accelerometer). The goal of this course is to familiarize students with some of the advanced analog circuit design ideas that are involved in these tasks. Specific topics will include analog filtering (continuous-time and discrete-time), sample-and-hold amplifiers, analog-to-digital converters, digital-to-analog converters. Prerequisites: 18-623 (was 18-523 before Fall 2005) and senior or graduate standing.

### **RFIC Design and Implementation (18-723) – 12 Units**

This course covers the design and analysis of radio-frequency integrated systems at the transistor level using state of the art CMOS and bipolar technologies. It focuses on system-level trade-offs in transceiver design, practical RF circuit techniques, and physical understanding for device parasitics. Accurate models for active devices, passive components, and interconnect parasitics are critical for predicting high-frequency analog circuit behavior and will be examined in detail. The course will start with fundamental concepts in wireless system design and their impact on design trade-offs in different transceiver architectures. Following that, RF transistor model, passive matching networks will be discussed. Noise analysis and low-noise amplifier design are studied next. The effects of nonlinearity are treated along with mixer design techniques. Practical bias circuit for RF design will be illustrated. Then, the importance of phase noise and VCO design will be considered together. The course will conclude with a brief study of frequency synthesizer and power amplifier design. Senior or graduate standing required.

### **Advanced Digital Integrated Circuit Design (18-725) – 12 Units**

The purpose of this course is to study the design process of VLSI CMOS circuits. This course covers all the major steps of the design process, which include: logic, circuit and layout design. A variety of computer-aided tools are discussed and used in class. The main objective of this course is to provide VLSI design experience that includes design of basic VLSI CMOS functional blocks,

verification of the design, testing and debugging. During the course, one complex VLSI project is submitted for fabrication. 4 hrs. lec.

### **Introduction to Computer Security (18-730) – 12 Units**

This course provides a principled introduction to techniques for defending against hostile adversaries in modern computer systems and computer networks. Topics covered in the course include operating system security; network security, including cryptography and cryptographic protocols, firewalls, and network denial-of-service attacks and defenses; user authentication technologies; security for network servers; web security; and security for mobile code technologies, such as Java and Javascript. More advanced topics will additionally be covered as time permits, such as: intrusion detection; techniques to provide privacy in Internet applications; and protecting digital content (music, video, software) from unintended use. Anti-requisites: 18-631 and 18-487

### **Network Security (18-730) – 12 Units**

Some of today's most damaging attacks on computer systems involve exploitation of network infrastructure, either as the target of attack or as a vehicle to advance attacks on end systems. This course provides an in-depth study of network attack techniques and methods to defend against them. Topics include firewalls and virtual private networks; network intrusion detection; denial of service (DoS) and distributed denial-of-service (DDoS) attacks; DoS and DDoS detection and reaction; worm and virus propagation; tracing the source of attacks; traffic analysis; techniques for hiding the source or destination of network traffic; secure routing protocols; protocol scrubbing; and advanced techniques for reacting to network attacks. Prerequisite: 18-630 OR 18-730, and senior or graduate standing.

### **Secure Software Systems (18-732) – 12 Units**

Poor software design and engineering are the root causes of most security vulnerabilities in deployed systems today. Moreover, with code mobility now commonplace--particularly in the context of web technologies and digital rights management--system designers are increasingly faced with protecting hosts from foreign software and protecting software from foreign hosts running it. This class takes a close look at software as a mechanism for attack, as a tool for protecting resources, and as a resource to be defended. Topics covered include the software design process; choices of programming languages, operating systems, databases and distributed object platforms for building secure systems; common software vulnerabilities, such as buffer overflows and race conditions; auditing software; proving properties of software; software and data watermarking; code obfuscation; tamper resistant software; and the benefits of open and closed source development. Senior or graduate standing required.

### **Applied Cryptography (18-733) – 12 Units**

A wide array of communication and data protections employ cryptographic mechanisms. This course explores modern cryptographic (code making) and cryptanalytic (code breaking) techniques in detail. This course emphasizes how cryptographic mechanisms can be effectively used within larger security systems, and the dramatic ways in which cryptographic mechanisms

can fall vulnerable to cryptanalysis in deployed systems. Topics covered include cryptographic primitives such as symmetric encryption, public key encryption, digital signatures, and message authentication codes; cryptographic protocols, such as key exchange, remote user authentication, and interactive proofs; cryptanalysis of cryptographic primitives and protocols, such as by side-channel attacks, differential cryptanalysis, or replay attacks; and cryptanalytic techniques on deployed systems, such as memory remanence, timing attacks, and differential power analysis. Senior or graduate standing required.

### **Foundation of Privacy (18-734) – 12 Units**

Privacy is a significant concern in modern society. Individuals share personal information with many different organizations - healthcare, financial and educational institutions, the census bureau, web services providers and online social networks - often in electronic form. Privacy violations occur when such personal information is inappropriately collected, shared or used. We will study privacy in a few settings where rigorous definitions and enforcement mechanisms are being developed - statistical disclosure limitation (as may be used by the census bureau in releasing statistics), semantics and logical specification of privacy policies that constrain information flow and use (e.g., by privacy regulations such as the HIPAA Privacy Rule and the Gramm-Leach-Bliley Act), principled audit and accountability mechanisms for enforcing privacy policies, anonymous communication protocols - and other settings in which privacy concerns have prompted much research, such as in social networks, location privacy and Web privacy (in particular, online tracking & targeted advertising).

### **Special Topics in Computer Systems: Engineering Safe Software Systems (18-737) – 12 Units**

Modern software systems suffer from poor reliability and security due to overwhelming complexity. Traditional software testing and debugging, which account for more than half the cost of software development, often fail to find critical bugs in software. In recent years there has been an increasing interest in developing automated techniques for improving software reliability. These techniques combine ideas from program analysis, constraint solving, and model checking and have shown great promises in making software more reliable and secure. In this course, we will study these new techniques, with emphasis on automated test-case generation based on symbolic execution and fuzz testing. We will see how these techniques can be used for detecting bugs in software, finding performance bottlenecks, detecting and preventing security vulnerabilities, and analyzing the reliability of software components. We will further study component-based verification and emerging techniques for automated software repair. Finally, we will discuss challenges related to the analysis of systems with deep learning components, which have a simpler structure than more traditional software but tend to be massive in scale. Senior or graduate standing required.

### **Sports Technology (18-738) – 12 Units**

The course's lecture content will cover background material on key aspects of sports technology, including topics such as computer vision, artificial intelligence, data mining, the physics of sports and understanding of real-world systems and guest lectures from experts in the field. The topics covered in depth will include the types of sensors and algorithms used in real-world systems

deployments today, as well as new applications of the Internet of Things to different aspects of sports, including training, performance, coaching, etc.

This course also comprises a semester-long project experience and research paper geared towards the development of skills to design realistic and practical embedded/mobile systems and applications that enhance various aspects of the training, coaching, playing and scouting of different sports, including football, hockey, baseball, soccer, etc. Students will work in teams on a project that will involve the hands-on design, configuration, engineering, implementation and testing of an embedded-system prototype of an innovative sports technology of their choice. Students will be expected to leverage proficiency and background gained from other courses, particularly with regard to embedded real-time principles, software systems and embedded programming. The project will utilize a synergistic mixture of skills in system architecture, modular system design, software engineering, subsystem integration, debugging and testing. From inception to demonstration of the prototype, the course will follow industrial project practices, such as version control, design requirements, design reviews, user studies and quality assurance plans. Advanced undergraduate or graduate standing required.

### **Computer Architecture – (18-740) – 12 Units**

The Internet has transformed our everyday lives, bringing people closer together and powering multi-billion dollar industries. The mobile revolution has brought Internet connectivity to the last-mile, connecting billions of users worldwide. But how does the Internet work? What do oft repeated acronyms like "LTE", "TCP", "WWW" or a "HTTP" actually mean and how do they work? This course introduces fundamental concepts of computer networks that form the building blocks of the Internet. We trace the journey of messages sent over the Internet from bits in a computer or phone to packets and eventually signals over the air or wires. We describe concepts that are common to and differentiate traditional wired computer networks from wireless and mobile networks. Finally, we build up to exciting new trends in computer networks such as the Internet of Things, 5-G and software defined networking. Topics include: physical layer and coding (CDMA, OFDM, etc.); data link protocol; flow control, congestion control, routing; local area networks (Ethernet, Wi-Fi, etc.); transport layer; and introduction to cellular (LTE) and 5-G networks. A final project asks you to build a HTTP video server of your own. This course is cross-listed with 18-441 - both editions will share Lectures and Recitations. However, students in the two courses will receive different exams and will have a different project. The students in the two versions of the course will be graded on a separate curve.

### **Computer Architecture and Systems (18-742) – 12 Units**

Historically, the performance and efficiency of computers has scaled favorably (according to "Moore's Law") with improvements at the transistor level that followed a steady trend (so-called "Dennard scaling"). Unfortunately, device scaling has hit a limit on performance and power improvements dictated by physical device properties. To continue to make systems capable, fast, energy efficient, programmable, and reliable in this "post-Dennard" era, computer architects must be creative and innovate across the layers of the system stack. This course begins with a recap of conventional, sequential computer architecture concepts. We will then discuss the end of convention, brought about by the end of Dennard Scaling and Moore's Law, and several trends that these changes precipitated. The first trend is the wholesale shift to parallel computer

architectures and systems, covering parallel hardware and software execution models, cache coherence, memory consistency, synchronization, transactional memory, and architecture support for programming, debugging, and failure avoidance. The second trend is the shift to incorporating specialized, heterogeneous components into parallel computer architectures. Topics will include reconfigurable architectures, FPGAs in the datacenter, ASIC accelerators, GPGPU architectures, and the changes to the system stack that these components demand. The third trend is the emergence of newly capable hardware and software systems and new models of computation. Topics will include approximate and neuromorphic computing, intermittent computing, emerging non-volatile memory and logic technologies, and analog and asynchronous architectures, and may include future emerging topics.

### **Energy Aware Computing (18-743) – 12 Units**

This course provides a comprehensive coverage of topics related to energy aware and green computing. While it is widely recognized that power consumption has become the limiting factor in keeping up with increasing performance trends, static or point solutions for power reduction are beginning to reach their limits. This course is intended to provide an insight into: (i) power and energy consumption modeling and analysis; (ii) energy aware computing, i.e., how various power reduction techniques can be used and orchestrated such that the best performance can be achieved within a given power budget, or the best power efficiency can be obtained under prescribed performance constraints; and (iii) green computing in the context of large scale computing systems or smart grid-aware computing. Recommended: basic VLSI design, basic computer system organization, basic compiler design and OS knowledge. Prerequisites: Senior or Graduate Standing.

### **Connected Embedded Systems Architecture (18-744) – 12 Units**

Connected Embedded Systems Architecture (CESA) is a one-semester lab-based course that addresses the core concepts of modern embedded systems with a particular emphasis on the emerging field of apps that span small, embedded devices (including wearable electronics, so-called Internet of Things devices, and mobile phones) to the cloud. We will examine the evolution of the nature of IoT from the early days of wireless sensor networks to the future vision of federated, time-synchronized, scalable, virtualized "fog computing" platforms.

The course is designed to take a systems approach and, as such, will include relevant topics from both software (cloud, network, device) and hardware (network and device). The course content is aimed at systems engineers who wish to architect, develop and deploy cloud-connected embedded systems in which the "apps" change, mature and evolve over time. The course stresses the creation of engineering frameworks in which tradeoffs can be rationally made between computing and storage that should be done on coin-cell-powered devices vs. computing and storage that should be done in the network or in the cloud.

### **Rapid Prototyping of Computer Systems (18-745) – 12 Units**

This is a project-oriented course which will deal with all four aspects of project development; the application, the artifact, the computer-aided design environment, and the physical prototyping



facilities. The class, in conjunction with the instructors, will develop specifications for a mobile computer to assist in inspection and maintenance. The application will be partitioned between human computer interaction, electronics, industrial design, mechanical, and software components. The class will be divided into groups to specify, design, and implement the various subsystems. The goal is to produce a working hardware/software prototype of the system and to evaluate the user acceptability of the system. We will also monitor our progress in the design process by capturing our design escapes (errors) with the Orthogonal Defect Classification (ODC). Upon completion of this course the student will be able to: generate systems specifications from a perceived need; partition functionality between hardware and software; produce interface specifications for a system composed of numerous subsystems; use computer-aided design tools; fabricate, integrate, and debug a hardware/software system; and evaluate the system in the context of an end user application. This course is cross-listed as 18540.

### **Storage Systems (18-746) – 12 Units**

This course covers the design, implementation, and use of storage systems, from the characteristics and operation of individual storage devices through the OS, database, and networking approaches involved in tying them together and making them useful to key applications' demands and technology trends. Topics to be covered include: network-attached storage, disk arrays, storage networking, storage management, advanced file systems, disk performance enhancement, wide-area data sharing, and storage security. 3 hrs. lec. The class will continue to be like previous years, with the same advanced content and high-level expectations.

### **Wireless Device Architecture (18-747) – 12 Units**

Growth of the Internet of Things depends on semiconductor devices & systems-on-chip (SoC) & with significant computational, communications and sensing capabilities. Integration of entire systems on one or a very small number of dies has made it possible to deploy hundreds of billions of end-points that will link the cyber world with the physical world. At this scale, a key design requirement is that such devices can be handled at most once during their lifetime. Batteries should be life-long, and reprogramming should be over-the-air. How then should such devices be architected? We begin by examining modern digital communications including modulation and coding schemes, basic RF subsystems and antennas. We examine the computational structures that allow us to reduce communication to computation. Anticipating that such devices will need to be highly programmable, we consider concepts from traditional computer architecture and their applicability to this energy-constrained domain. We also examine the rapid evolution of transducer technologies and how these are being integrated into SoCs. Then, we consider how an architect can make tradeoffs across these domains to meet design objectives. Students will take advantage of a purpose-built experimental platform called PowerDuoé that enables deep exploration of these topics in realistic applications. Background in computer architecture, signals and systems, and E&M field theory is recommended. Graduate standing is required to register for this course.

### **Wireless Sensor Networks (18-748) – 12 Units**

The use of distributed wireless sensor networks have surged in popularity in recent years with applications ranging from environmental monitoring, to people- and object-tracking in both

cooperative and hostile environments. This course is targeted at understanding and obtaining hands-on experience with the state of the art in such wireless sensor networks which are often composed using relatively inexpensive sensor nodes that have low power consumption, low processing power and bandwidth. The course will span a variety of topics ranging from radio communications, network stack, systems infrastructure including QoS support and energy management, programming paradigms, distributed algorithms and example applications. Some guest lectures may be given. Each discussion-oriented lecture will be preceded by the reading of 1-2 papers, resulting in a rich collection of papers by the end of the semester. Early in the semester, hands-on exercises will be used to teach the programming of FireFly sensor nodes by using the 'nano-RK' power-aware sensor real-time operating system (RTOS) and using 802.15.4 radio communications. Then, project groups of no more than 3 students will define, design, implement and test a sensor network project. Final in-class project presentations will be supplemented by a written report. A final exam may be conducted to evaluate the students' understanding of the materials covered. Grading criteria will include classroom participation, course project content and report, and a final exam. Class size will be limited to 20 students or less. Hands-on experience with network programming, operating systems and assembly language are essential. Exceptions only with explicit permission of instructor. Prerequisites: 15-213 and ((18-348 or 18-349) or 15-410), and senior or graduate standing.

### **Building Reliable Distributed Systems (18-749) – 12 Units**

The course provides an in-depth and hands-on overview of designing and developing reliable distributed systems, throughout a system's lifecycle, starting from fault-tolerant design and execution (replication, group communication, databases) to fault-recovery (fault-detection, logging, check-pointing, failure-diagnosis) for various classes of faults (crashes, communication errors, software upgrades). The course will cover real-world practices for reliability, supplemented by case studies of large-scale downtime incidents. The concepts will be taught in the context of contemporary cloud-computing platforms, and the course will include a hands-on project that involves the design, implementation and empirical evaluation of a reliable distributed cloud-based system. Students will be taught to write, review, and present a conference-style research paper by the end of the semester, with the goal of documenting the design, lessons learned and experimental results of their team project. Students can expect to learn about the reliability issues underlying cloud computing, the tools and best practices for implementing and evaluating reliability, and the strengths and weaknesses of current cloud-computing platforms from the perspective of reliability. Prerequisites: Graduate standing or instructor permission

### **Wireless Networks and Applications (18-750) – 12 Units**

This course introduces fundamental concepts of wireless networks. The design of wireless networks is influenced heavily by how signals travel through space, so the course starts with an introduction to the wireless physical layer, presented in a way that is accessible to a broad range of students. The focus of the course is on wireless MAC concepts including CSMA, TDMA/FDMA, and CDMA. It also covers a broad range of wireless networking standards, and reviews important wireless network application areas (e.g., sensor networks, vehicular) and other applications of wireless technologies (e.g., GPS, RFID, sensing, etc.). Finally, we will touch on public policy issues,

e.g., as related to spectrum use. The course will specifically cover: Wireless networking challenges Wireless communication overview Wireless MAC concepts Overview of cellular standards and LTE Overview of wireless MAC protocols WiFi, bluetooth and personal area networks, etc. Wireless in today's Internet: TCP over wireless, mobility, security, etc. Advanced topics, e.g., mesh and vehicular networks, sensor networks, DTNs, localization, sensing, etc. Although students in 18-750 will share Lectures and Recitations with students in 18-452, they will receive distinct homework assignments and exams from students in 18-452. The main project will also be different. The students in the two version of the course will also be graded on a separate curve.

### **Applied Stochastic Processes (18-751) – 12 Units**

Basic probability concepts : Probability space, simple and compound events, statistical independence, and Bayes Rule. Total Probability Concept; Bernoulli trials; Poisson Law. De Moivre-Laplace Theorem. Definition of a Random Variable (RV); Probability distribution of an RV: cumulative distribution function (CDF) and probability density function (PDF). Two Random Variables; several Random Variables. Functions of RV's; conditional distributions; conditional expectations; joint distributions. Moments, generating functions, and characteristic functions of RVs. Chebyshev inequality. Estimation; linear estimation; minimum mean square estimation; and orthogonality principle. Limit theorems; Central Limit Theorem; Law of Large Numbers (both strong LLN and Weak LLN). Definition of a Random Process (RP). Different notions of stationarity. Poisson and Gaussian processes. Autocorrelation and Power Spectral Density (PSD) of an RP. Processing of random (stochastic) processes by linear systems. Ergodicity. Spectral analysis. Matched Filtering. Selected applications from telecommunications, data networking (queuing), Kalman filtering.

### **Estimation, Detection and Learning (18-752) – 12 Units**

This course discusses estimation, detection, identification and machine learning, covering a variety of methods, from classical to modern. In detection, the topics covered include hypothesis testing, Neyman-Pearson detection, Bayesian classification and methods to combine classifiers. In estimation, the topics include maximum-likelihood and Bayesian estimation, regression, prediction and filtering, Monte Carlo methods and compressed sensing. In identification and machine learning, topics include Gaussian and low-dimensional models, learning with kernels, support vector machines, neural networks, deep learning, Markov models and graphical models.

### **Information Theory (18-753) – 12 Units**

The first half of the course comprises of the concepts of entropy, mutual information, the Asymptotic Equipartition property, applications to source coding (data compression), applications to channel capacity (channel coding), differential entropy and its application to waveform channel capacities, and a subset of advanced topics such as network information theory, or rate-distortion theory, as time permits. The second half of the course comprises finite-field algebra, Hamming codes, cyclic codes (CRC and BCH codes), a brief introduction to Reed-Solomon codes, and perhaps universal codes (Lempel-Ziv coding). Prerequisites: 36-217 and senior or graduate standing.

### **Error Control Coding: Theory and Applications (18-754) – 12 Units**

Modern digital communication systems and digital data storage systems owe their success, in part to the use of error control coding. By careful insertion of redundant bits or symbols in the transmitted or stored bit streams, the receiver can detect and correct errors induced by channel impairments such as noise, inter-symbol interference and noise. For example, compact disc (CD) owes its ruggedness to the use of cross-interleaved Reed-Solomon (CIRC) code. High-speed networks employ Cyclic Redundancy Check (CRC) to ensure that the data was transmitted accurately. This course is aimed at introducing the basic theory and select applications of error control coding (ECC). Towards that goal, following topics will be covered. Mathematical background Linear block codes Low density parity check (LDPC) codes Cyclic codes Reed-Solomon (RS) codes Convolutional codes Turbo codes Example application of ECC in digital communications Example application of ECC in digital data storage.

### **Networks in the Real World (18-755) – 12 Units**

18-755 is a graduate-level course that focuses on networks and their applications to various natural and technological systems. Specifically, this class delves into the new science behind networks and their concrete applications technological, biological, and social systems, as well as various design synergies that exist when looking at these systems from a cyber-physical perspective. By scope and contents, this is not just another class on "networks". Want to know how complex networks dominate our world? How communities arise in social networks? How group behavior dominates Twitter? How swarms of bacteria can navigate inside the human body? How patterns of interaction can be identified in hardware and software systems? Want to work on cutting edge projects involving systems and synthetic biology? Or social networks? Or networks-on-chip and internet-of-things? Then this class is for you! Course requirements consist of a few homework assignments, a semester-long project, and in-class presentations of relevant papers. By structure and contents, this class targets primarily the computer engineering and computer science students, but it also provides a valuable foundation for interdisciplinary research to students in related disciplines. Senior or graduate standing is required to take this course.

### **Packet Switching and Computer Networks (18-756) – 12 Units**

This course is designed to provide graduate students an understanding of the fundamental concepts in computer networks of the present and the future. In the past, the scarce and expensive resource in communication networks has been the bandwidth of transmission facilities. Accordingly, the techniques used for networking and switching have been chosen to optimize the efficient use of this resource. These techniques have differed according to the type of information carried: circuit switching for voice and packet switching for data. It is expected that elements of circuit and packet switching will be used in the integrated networks. This course focuses on packet switching for computer networks and protocol design. Topics in the course include: computer networks over-view; OSI layers, queuing theory; data link protocol; flow control; congestion control; routing; local area networks; transport layer. The current networks and applications will be introduced through the student seminars in the last weeks of the course. 4 hrs. lec. Prerequisites: 18-345 and senior or graduate standing.

### **Network Management and Control (18-757) – 12 Units**

This course provides an understanding of the principles of broadband networks. The broadband networks differ from currently existing communication networks in many aspects and these issues will be dealt with in the course. Broadband networks are designed to support many different services, ranging from low bandwidth (telemetry) to high bandwidth applications (digitized video). The course will cover the underlying concepts of the broadband networks, and expose the research problems in next generation networks. Many concepts (ATM, SONET, MPLS, high-speed switching architecture, high-speed network control, unified control plane (GMPLS), and optical networks) will be discussed. The course project will explore latest network technologies, design networking systems, and evaluate via simulation techniques. 4 hrs. lec. Prerequisites: A course in probability; 18-756 and senior or graduate standing.

### **Wireless Communications (18-758) – 12 Units**

In this course, the communication problem will be introduced, and channel impairments such as noise, inter-symbol interference and fading will be described. Solutions to combat these impairments, based on digital communication theory, will be described. These will include signal space analysis, detection, equalization, coding and diversity. Examples drawn from communication standards will illustrate how the theory is implemented in practical communication systems.

### **Wireless Networks (18-759) – 12 Units**

In this course, we will do a quick review of wireless communications and networking principles which will be the basis of more advanced work and research. The emphasis will be on understanding the impact of mobility and connectivity that can be provided or supported by different wireless networks. To this end, wireless communications standards such as GSM (2G), 3G, 4G, and the ongoing work on 5G in addition to key wireless technologies such as Bluetooth, WiFi, Zigbee, RFID, and WiMax will be reviewed. Then, we will study the key papers in the following hot topics in wireless networking: 1) Ad Hoc Wireless Networks and Sensor Networks; 2) Self-organizing networks and adaptive complex networks; 3) Cognitive Networks; 4) Vehicular Ad Hoc Networks; 5) Social Networks; 6) The challenges of 5G wireless networks; 7) Internet of Things (IoT); 8) Role of Artificial Interference (AI ) and Machine Learning (ML) in wireless networks.

### **VLSI CAD: Logic to Layout (18-760) – 12 Units**

A large digital integrated circuit (IC) may require 100,000 lines of high-level description in a hardware modeling language, which then turns into 10,000,000 logic gates, which ultimately end up as 1 billion polygons on the masks that define the integrated circuit. This course describes in detail the important CAD tools that perform the many steps of the transformation from Boolean equations to fabrication masks. We focus on mathematical models, algorithms, and data structures. We will write programs for simple versions of these tools. We will look at, and experiment with, a few real tools. The course covers a review of Boolean algebra, followed by (i) synthesis tools for 2-level and multi-level logic, that transform Boolean equations and finite state machine descriptions into optimized logic, and (ii) verification tools that decide whether the logic

you built does the same thing as the specification you started with. Finally, the course covers geometric layout synthesis tools for component partitioning, placement, and wire routing and timing verification tools that determine if performance constraints are met. The CAD algorithms covered in the lectures are applicable not only to VLSI systems, but also to non-silicon applications (e.g., social computing, biology, financial).

### **Circuit Simulation: Theory and Practice (18-762) – 12 Units**

This course explores the models, numerical methods and algorithms that are used for simulation and optimization of circuits. The course begins with coverage of the algorithms that are used in the ubiquitous SPICE program and its many variants. This is followed by an overview of the numerous analog and digital simulation techniques that have followed since the introduction of SPICE. The course further covers some of the most recent modeling and simulation work including, but not limited to, model order reduction, harmonic balance methods, nonlinear macromodeling, compact device modeling, and statistical timing analysis. Finally, the use of circuit simulation algorithms for non-circuit problems will be explored. 4 hrs. lec.

### **Digital System Testing and Testable Design (18-675) – 12 Units**

For this course, time- and topic-indexed videos of lecture, homework, projects, etc. will be available from the online learning portal/website. In addition to these resources, two 1-hour live sessions are scheduled per week for recitation. Each student is strongly urged to attend one of these two sessions each week, either remotely or in the classroom on the Carnegie-Mellon Pittsburgh campus. This course examines in depth the theory and practice of fault analysis, test generation, and design for testability for digital ICs and systems. The topics to be covered include circuit and system modeling; fault sources and types; the single stuck-line (SSL), delay, and functional fault models; fault simulation methods; automatic test pattern generation (ATPG) algorithms for combinational and sequential circuits, including the D-algorithm, PODEM, FAN, and the genetic algorithm; testability measures; design-for-testability; scan design; test compression methods; logic-level diagnosis; built-in self-testing (BIST); VLSI testing issues; and processor and memory testing. Advance research issues, including topics on MEMS and mixed-signal testing are also discussed. 4 hours of lecture per week Prerequisites: 18-240 and 15-211 and (18-340 or 18-341) Senior or graduate standing required.

### **Linear Systems (18-771) – 12 Units**

A modern approach to the analysis and engineering applications of linear systems. Modeling and linearization of multi-input-- multi-output dynamic physical systems. State-variable and transfer function matrices. Emphasis on linear and matrix algebra. Numerical matrix algebra and computational issues in solving systems of linear algebraic equations, singular value decomposition, eigenvalue-eigenvector and least-squares problems. Analytical and numerical solutions of systems of differential and difference equations. Structural properties of linear dynamic physical systems, including controllability, observability and stability. Canonical realizations, linear state-variable feedback controller and asymptotic observer design. Design and computer applications to electronic circuits, control engineering, dynamics and signal processing. 4 hrs. lec. Pre-Reqs: 18-470 or 18-474 and Graduate standing in CIT or MCS.

### **Non Linear Control (18-776) – 12 Units**

This course provides an introduction to the analysis and design of nonlinear systems and nonlinear control systems; stability analysis using Lyapunov, input-output and asymptotic methods; and design of stabilizing controllers using a variety of methods selected from linearization, vibrational control, sliding modes, feedback linearization and geometric control. 4 hrs. lec.

### **Complex Large-Scale Dynamic Systems (18-777) – 12 Units**

This course is motivated by the ever-growing complexity of man-made dynamic systems and the need for flexible monitoring, operations and design techniques for such systems. Of particular interest are systematic model-based methods for relating the key real-life problems for such systems and the state-of-the-art techniques for large-scale dynamic systems. Examples of such real-life complex systems are critical man-made infrastructure systems (electric power systems, gas networks, transport industries, data networks, and their interdependencies) as well as large-scale systems on chips. In this course we will first review the traditional large-scale methods for model simplification (aggregation), time scale separation of sub-processes and singular perturbation techniques to account for these, stability analysis, and estimation and control. In the second, novel part of this course, we recognize the highly interactive nature of the evolving complex systems, in which much monitoring, data gathering, and decision making is made at the lower, physical levels of the system, and some coordination exists at the higher system level at which physical layers interact. Several conceptual challenges are posed for minimal coordination of such decision makers under high uncertainties, in order to have predictable performance. These concepts will be illustrated using the same man-made network systems of interest introduced at the beginning of the course. Requirements: Some background in dynamic systems is highly desirable. Students interested in large-scale real-life complex systems, their relation to the state-of-the-art methods available and new research challenges will gain from taking this course. 4 hrs lec. Prerequisites: senior or graduate standing.

### **Speech Recognition and Understanding (18-781) – 12 Units**

The technology to allow humans to communicate by speech with machines or by which machines can understand when humans communicate with each other is rapidly maturing. This course provides an introduction to the theoretical tools as well as the experimental practice that has made the field what it is today. We will cover theoretical foundations, essential algorithms, major approaches, experimental strategies and current state-of-the-art systems and will introduce the participants to ongoing work in representation, algorithms and interface design. This course is suitable for graduate students with some background in computer science and electrical engineering, as well as for advanced undergraduates. Prerequisites: Sound mathematical background, knowledge of basic statistics, good computing skills. No prior experience with speech recognition is necessary. This course is primarily for graduate students in LTI, CS, Robotics, ECE, Psychology, or Computational Linguistics. Others by prior permission of instructor.

### **Machine Learning (18-782) – 12 Units**

Machine Learning is a foundational discipline of the Information Sciences. It combines elements from Mathematics, Computer Science, and Statistics with applications in Biology, Physics, Engineering and any other area where automated prediction is necessary. The aim of the course is to present some of the topics which are at the core of modern Machine Learning, from fundamentals to state-of-the-art methods. Emphasis will be put both on the essential theory and on practical examples and lab projects. Each exercise has been carefully chosen to reinforce concepts explained in the lectures or to develop and generalize them in significant ways. This course is directed both at students without previous knowledge in Machine Learning, and at those wishing to broaden their expertise in this area. The course assumes some basic knowledge of probability theory and linear algebra. Nevertheless, the first module of the course will revisit these topics. Students are also expected to have knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program. Students who have already taken CS 10-701/15-781 or ECE 18-697 should not take this course.

### **Data, Inference, and Applied Machine Learning (18-785) – 12 Units**

Please see the ECE website <https://www.ece.cmu.edu/> for more information. This course will provide the methods and skills required to utilize data and quantitative models to automate predictive analytics and make improved decisions. From descriptive statistics to data analysis to machine learning the course will demonstrate the process of collecting, cleaning, interpreting, transforming, exploring, analyzing and modeling data with the goal of extracting information, communicating insights and supporting decision-making. The advantages and disadvantages of linear, nonlinear, parametric, nonparametric and ensemble methods will be discussed while exploring the challenges of both supervised and unsupervised learning. The importance of quantifying uncertainty, statistical hypothesis testing and communicating confidence in model results will be emphasized. The advantages of using visualization techniques to explore the data and communicate the outcomes will be highlighted throughout. Applications will include visualization, clustering, ranking, pattern recognition, anomaly detection, data mining, classification, regression, forecasting and risk analysis. Participants will obtain hands-on experience during project assignments that utilize publicly available datasets and address practical challenges.

### **Wavelets and Multiresolution Techniques (18-790) – 12 Units**

The goal of this course is to expose students to multiresolution signal processing methods and their use in real applications as well as to guide them through the steps of the research process. All the necessary mathematical tools are introduced with an emphasis on extending Euclidean geometric insights to abstract signals; the course uses Hilbert space geometry to accomplish that. With this approach, fundamental concepts---such as properties of bases, Fourier representations, sampling, interpolation, approximation, and compression---are often unified across finite dimensions, discrete time, and continuous time, thus making it easier to focus on the few essential differences. The course covers signal representations on sequences, specifically local Fourier and wavelet bases and frames. It covers the two-channel filter bank in detail, and uses this signal-processing device as the implementation vehicle for all sequence representations that follow. The local Fourier and wavelet methods are presented side-by-side, without favoring any one in particular. Through the project, students will learn how to choose an appropriate



representation and apply it to the specific problem at hand. There will be 2-3 hours of pre-recorded video per week that can be viewed online at any time. There will also be two 1-hour sessions in person that are not mandatory and can be viewed later online. The instructor will also be available for meetings in person or online as needed. The total amount of work per week is expected to be around 12 hours on average Pre-requisite: 18-491. Students are expected to have a good background in basic engineering mathematics, signal processing and linear algebra. This course is cross listed with 42-732

### **Methods in Medical Image Analysis (18-791) – 12 Units**

Students will gain theoretical and practical skills in medical image analysis, including skills relevant to general image analysis. The fundamentals of computational medical image analysis will be explored, leading to current research in applying geometry and statistics to segmentation, registration, visualization, and image understanding. Student will develop practical experience through projects using the National Library of Medicine Insight Toolkit (ITK), a popular open-source software library developed by a consortium of institutions including Carnegie Mellon University and the University of Pittsburgh. In addition to image analysis, the course will include interaction with clinicians at UPMC. It is possible that a few class lectures may be videoed for public distribution. Prerequisites: Knowledge of vector calculus, basic probability, and either C++ or python.

### **Advanced Digital Signal Processing (18-792) – 12 Units**

This course will examine a number of advanced topics and applications in one-dimensional digital signal processing, with emphasis on optimal signal processing techniques. Topics will include modern spectral estimation, linear prediction, short-time Fourier analysis, adaptive filtering, plus selected topics in array processing and homomorphic signal processing, with applications in speech and music processing. 4 hrs. lec.

### **Image and Video Processing (18-793) – 12 Units**

This course covers signal processing techniques specialized for handling 2D (images) and 3D (videos) signals. It builds upon 1D signal processing techniques developed in 18-290 and 18-491 and specializes them for the case of images and videos. In this class, you will learn fundamental tools and techniques for processing images and videos, and will learn to apply them to a range of practical applications. This course provides the fundamentals for studying images and videos. We will develop signal models specific to images and videos, develop associated optimization techniques for solving restoration problems like denoising, inpainting, study specialized compression algorithms. Specific focus will be on transform-domain, PDE and sparsity-based models and associated optimization techniques. These formal techniques will be enriched via applications in mobile devices, medical image processing, and compressive sensing.

### **Pattern Recognition Theory (18-794) – 12 Units**

Decision theory, parameter estimation, density estimation, non-parametric techniques, supervised learning, linear discriminant functions, clustering, unsupervised learning, artificial neural networks, feature extraction, support vector machines, and pattern recognition applications (e.g., face recognition, fingerprint recognition, automatic target recognition, etc.).

4 hrs. lec. Prerequisites: 36-217, or equivalent introductory probability theory and random variables course and an introductory linear algebra course and senior or graduate standing.

### **Bioimage Informatics (18-795) – 12 Units**

Bioimage Informatics (formerly Bioimaging) 12 units This course gives an overview of tools and tasks in various biological and biomedical imaging modalities, such as fluorescence microscopy, electron microscopy, magnetic resonance imaging, ultrasound and others. The major focus will be on automating and solving the fundamental tasks required for interpreting these images, including (but not restricted to) deconvolution, registration, segmentation, pattern recognition, and modeling, as well as tools needed to solve those tasks (such as Fourier and wavelet methods). The discussion of these topics will draw on approaches from many fields, including statistics, signal processing, and machine learning. As part of the course, students will be expected to complete an independent project. Prerequisites: 18-396 Signals and Systems

### **Machine Learning for Signal Processing (18-797) – 12 Units**

Signal Processing is the science that deals with extraction of information from signals of various kinds. This has two distinct aspects -- characterization and categorization. Traditionally, signal characterization has been performed with mathematically-driven transforms, while categorization and classification are achieved using statistical tools. Machine learning aims to design algorithms that learn about the state of the world directly from data. A increasingly popular trend has been to develop and apply machine learning techniques to both aspects of signal processing, often blurring the distinction between the two. This course discusses the use of machine learning techniques to process signals. We cover a variety of topics, from data driven approaches for characterization of signals such as audio including speech, images and video, and machine learning methods for a variety of speech and image processing problems. Prerequisites: Linear Algebra, Basic Probability Theory, Signal Processing and Machine Learning. 18-797 is a cross listing of 11-755 offered by LTI.

### **Fundamentals of Semiconductors and Nanostructures (18-817) – 12 Units**

This course is designed to provide students with a foundation of the physics required to understand nanometer-scale structures and to expose them to different aspects of on-going research in nanoscience and nanotechnology. Illustrative examples will be drawn from the area of semiconductor nanostructures, including their applications in novel and next-generation electronic, photonic, and sensing devices. The course begins with a review of basic concepts in quantum physics (wave-particle duality, Schrödinger's equation, particle-in-a-box, approximation methods in quantum mechanics, etc.) and then continues with a discussion of bulk three-dimensional solids (band structure, density of states, the single-electron effective-mass approximation). Size effects due to nanometer-scale spatial localization are then discussed within a quantum-confinement model in one-, two-, and three- dimensions for electrons. An analogous discussion for photons is also presented. The basic electronic, optical, and mechanical properties of the low-dimensional nanostructures are then discussed. A select number of applications in electronics, photonics, biology, chemistry, and bio-engineering will be discussed to illustrate the

range of utility of nanostructures. Upon completion of the course, students will have an appreciation and an understanding of some of the fundamental concepts in nanoscience and nanotechnology. The course is suitable for first-year graduate students in engineering and science (but advanced undergraduates with appropriate backgrounds may also take it with permission from the instructor). Prerequisites: 09-511, 09-701, 09-702, 18-303, 18-310, 18-402, 27-770, 33-225, 33-234 or familiarity with the material or basic concepts covered in these courses and senior or graduate standing.

### **Mobile and Pervasive Computing (18-843) – 12 Units**

This is a course exploring research issues in the newly emerging field of mobile computing. Many traditional areas of computer science and computer engineering are impacted by the constraints and demands of mobility. Examples include network protocols, power management, user interfaces, file access, ergonomics, and security. This will be an "advanced" course in the truest sense --- most, if not all, the topics discussed will be ones where there is little consensus in the research community on the best approaches. The course will also offer significant "hand-on" experience in this area. Each student will have to present and lead the discussion on a number of papers. Students will work in groups of three under the guidance of a mentor on a hands-on project. Each student will also be required to write one of two documents: (a) a research proposal (similar in spirit to an NSF proposal) on an idea in mobile computing or (b) a short business plan for a commercial opportunity in mobile computing. Grading will be based on the quality of the presentations, the project, and the proposal or business plan. Prerequisites: 15-410 and senior or graduate standing.

### **Internet Services (18-845) – 12 Units**

This course investigates the issues involved in providing scalable and highly available network services over the best-effort Internet. Examples of such services include Web servers, application servers, search engines, proxy caches, online auction systems, and remote visualization. Topics include network programming, server design, clustering, caching, proxies, remote execution, resource naming, discovery, and monitoring, and wide-area metacomputing. The course consists of lectures on existing technology, student presentations of research papers, and a project where students design and implement a significant network service.

### **Wireless Systems Design Experience (18-846) – 12 Units**

This project-oriented course is the culmination of the MS ECE Wireless Systems Concentration. It provides third-semester students with a design experience that brings together concepts from the Wireless Systems core to solve a real-world problem.

The class organizes the students as a design team to build an outdoor system for distributed sensing of physical quantities, wireless connectivity to a data repository, and analysis and presentation of the data. The specific problem domains (e.g., pavement-mounted traffic sensors, sensors for overland water flow, soil moisture, or stream height) are selected to present specific challenges in wireless connectivity, low-power operation, distributed synchronization, federation of dissimilar sensor types, real-time computation, and information presentation. The instructors and project sponsors (customers) will guide the students in developing an understanding of the problem domain (environment and requirements) and selecting suitable technologies for

addressing the challenges specific to it, creating and documenting a system architecture with verifiable interfaces, decomposing the architecture into sub-problems that sub-groups of students can address, integrating the results into a single system, and verifying system performance against the documented requirements. Consistent with the Wireless Systems concentration methodologies, student work will be organized around fixed-length sprints followed by an evaluation of progress with the customer and instructors.

Upon completion of this course, the student will be able to: generate systems specifications from a perceived need; partition functionality between hardware and software; produce interface specifications for a system composed of wirelessly-connected subsystems; use power and RF modeling tools; fabricate, integrate, and debug a hardware/software system; and evaluate the system in the context of an end user application.

### **Engineering and Economics of Electric Energy Systems (18-875) – 12 Units**

The course has two parts. The first part introduces basic components and networks used in the electric power industry. This is followed by systematic modeling of these components, as well as of the entire system. Methods for modeling and analyzing both system equilibria and dynamics are presented. Simulations and lab demos are given to simulate and analyze typical system blackouts. This is followed by introducing decision and control methods for preventing these problems, as well as for managing the system more reliably, securely and efficiently over broad ranges of its operating conditions. The emphasis is on IT, software and control (both distributed and coordination) for achieving pre-specified system performance. This part of the course will involve simulation demos and hands on studies in which students create their own power network, simulate it and assess for performance. The second part of the course will review the industry structure, the experience with deregulation, and economic issues concerning choice of generating fuel and technology, the costs of blackouts, and environmental discharges. The course will integrate engineering and economic aspects to examine the design, investment, and operations that satisfy public desires for low cost, nonpolluting, reliable, and secure power. Knowledge of basic electric circuits and/or basic economics is assumed. 3 hrs. lec., 1 hr. rec. Prerequisites: Basic electric circuits and/or basic economics and at least graduate standing.

### **Ph.D. Reading and Research (18-990) – Variable Units**

Ph.D. level research.

### **Introduction to Graduate Studies (18-989) – 1 Unit**

The Introduction to Graduate Studies course is designed to increase awareness and understanding of academic integrity issues, Carnegie Mellon community standards and the ethical job search. This is done via various sessions/modules that are already offered via several entities throughout campus (such as the CPDC, ICC, and GCC). Topics covered include: paraphrasing and citation, participating in the US classroom, avoiding plagiarism, unconscious bias, combating sexual violence on campus, finding jobs and internships, negotiation, communication, relationship building and other topics of interest. The course culminates in students writing a reflection paper. For international students, the paper should compare

western academic and cultural standards to those of their home country. For domestic students, the paper should be a reflection on CMU's community standards. Active participation in 5 sessions/modules in the above mentioned areas and the submission of the reflection paper will determine a pass/fail grade.

### **Internship for Electrical and Computer Engineering Ph.D. Students (18-996, 18-997, 18-998) – Variable Units**

The Department of Electrical and Computer Engineering considers experiential learning opportunities important educational options for its graduate students. One such option is an internship, normally completed during the summer. The ECE Graduate Office will add the course to the student's schedule. This process should be used by any Electrical and Computer Engineering graduate student wishing to have their internship experience reflected on their official University transcript. International students should also be authorized by the Office of International Education (OIE). Completion of written assignments and requirements will determine the letter grade for the course. Prerequisites: Graduate standing in ECE

### **ECE Graduate Teaching Internship (18-992) – 12 Units**

Two semesters of Teaching Internship are required for the ECE Ph.D. program. Ph.D. students or M.S. students who intend to pursue a Ph.D. are eligible for the TI. Students should obtain their advisor's permission prior to applying for the TI. Students must complete the online TA application to be considered for a position. TIs are assigned to work 10 hours per week. Registration of 12 units is required for each semester of teaching. See <http://www.ece.cmu.edu/student/teaching.html> for further information about applying for a teaching internship position.

## **APPENDIX D: ADDITIONAL INFORMATION ON FEDERAL AND STATE AID / FINANCIAL AID POLICIES**

### Carnegie Mellon University Consumer Information

Below is a summary of consumer information made available to all Carnegie Mellon University prospective and current students as required by the Higher Education Act of 1965, as amended. Required Disclosure have been categorized into five topics. Each disclosure gives a brief description of information that is required to be disclosed and explains how it can be obtained. This information may be changed from time to time as required.

If you need assistance or would like a paper copy, contact the Student Financial Aid Office, 5000 Forbes Avenue, Warner Hall, Pittsburgh, PA. If you wish to speak with a representative about the information contained here, please contact Associate Director Catherine Demchak at (412) 268-1353.

### Information about the Institution:

## Accreditation Information

Carnegie Mellon University is accredited by the Middle States Commission on Higher Education (MSCHE), 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104 ([www.msche.org](http://www.msche.org)). The Commission may be contacted by telephone at 267-284-5000 or via email at [info@msche.org](mailto:info@msche.org) or [espanolinfo@msche.org](mailto:espanolinfo@msche.org) (Spanish/Español). The university's current "Statement of Accreditation Status" can be found at, <https://www.msche.org/institution/>.

## State Approvals

Carnegie Mellon University is licensed to operate in the states listed below. Individuals may contact the relevant agency for more information or information about how to file a complaint.

### **California**

Bureau for Private Postsecondary Education  
1747 North Market Blvd, Suite 225, Sacramento, CA 95834  
Telephone: 888-370-7589  
Email: [bppe@dca.ca.gov](mailto:bppe@dca.ca.gov)  
Website: [www.bppe.ca.gov](http://www.bppe.ca.gov)

### **New York**

New York State Education Department  
Office of Higher Education  
Room 977 Education Building Annex  
Albany, NY 12234  
Telephone: 518-486-3633  
Email: [hedepcom@nysed.gov](mailto:hedepcom@nysed.gov)  
Website: [www.highered.nysed.gov](http://www.highered.nysed.gov)

### **Pennsylvania**

Pennsylvania Department of Education  
Office of Postsecondary and Higher Education  
333 Market Street, 12th Floor  
Harrisburg, PA 17126-0333  
Telephone: 717-783-8228  
Email: [ra-collunivseminfo@pa.gov](mailto:ra-collunivseminfo@pa.gov)  
Website: [www.education.state.pa.us](http://www.education.state.pa.us)

### **Washington, D.C.**

Office of the State Superintendent of Education  
Government of the District of Columbia  
810 First Street NE 9th Floor  
Washington, DC 20002  
Telephone: 202-727-6436  
Email: [osse@dc.gov](mailto:osse@dc.gov)  
Website: [osse.dc.gov](http://osse.dc.gov)

Inquiries regarding the university's accreditation status or authorization to operate in any of the above states may be directed to: Associate Vice President / Director of Enrollment Services, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh PA 15213, telephone: 412-268-5399, email: [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu).

### Distance Education, State Authorization and Reciprocity Agreement (SARA)

The State Authorization Reciprocity Agreement (SARA) is an agreement among member states, districts, and territories in the United States, which establishes national standards for interstate offering of postsecondary distance education courses and programs. It is intended to standardize the process of offering online courses and programs by postsecondary institutions located in states other than the state in which the enrolled student(s) are residing. SARA is overseen by a national council (NC-SARA) and administered by four regional education compacts.

Carnegie Mellon University has been approved by the Commonwealth of Pennsylvania to participate in NC-SARA and was accepted as a SARA institution on May 2, 2017; additionally, Carnegie Mellon secured approval through NC-SARA on May 18, 2017. Carnegie Mellon University is listed as an approved, participating institution on the NC-SARA website (<http://www.nc-sara.org/>). At this time, 49 of the 50 United States are SARA members. California is not a member of SARA; however, Carnegie Mellon is able to offer online education to California residents.

Except where prohibited by applicable law, students who reside outside of the United States generally are not restricted from enrolling in our online programs. Some online programs do require in-person attendance at one of Carnegie Mellon's teaching locations (e.g., Carnegie Mellon's Pittsburgh, Pennsylvania campus) for short portions of the program. Students interested in enrolling in a specific online program are encouraged to contact the person designated by the online program for questions about the program's requirements or enrollment.

### Copyright Infringement Policies

Carnegie Mellon University takes copyright violation seriously. Besides raising awareness about copyright law, it takes appropriate action in support of enforcement as required by policy and law. United States copyright law (<http://www.copyright.gov/>) "protects the original works of authorship fixed in any tangible medium of expression, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device".

The University's Fair Use Policy (<http://www.cmu.edu/policies/administrative-and-governance/fair-use.html>) states that all members of the University must comply with US copyright law and it explains the fair use standards for using and duplicating copyrighted material. In addition, the policy prohibits the duplication of software for multiple uses, meeting the Digital Millennium Copyright Act (DMCA) (<http://www.copyright.gov/legislation/dmca.pdf>) requirements. The DMCA criminalizes the development or use of software that enables users to access material that is copyright protected. Furthermore, the Computing Policy (<http://www.cmu.edu/policies/information-technology/computing.html>) prohibits the

distribution of copyright protected material via the University network or computer systems, unless the copyright owner grants permission.

The Higher Education Opportunity Act of 2008 (Public Law 110-315) Section 488, requires institutions of higher education to annually inform students that "unauthorized distribution of copyrighted material, including unauthorized peer-to-peer file sharing, may subject the students to civil and criminal liabilities". Carnegie Mellon does this by publication of a news article on Computing Services' website or via mass mail communication each semester. The law goes on to require institutions "to provide a summary of penalties for violation of Federal copyright laws, including disciplinary actions that are taken against students who engage in unauthorized distribution of copyrighted materials using the institution's information system." Copyright protected materials can include, but are not necessarily limited to:

Music

Movies or other videos

Literary works

Software

Digital images or libraries

#### Cost of Attending the University

Actual tuition and fee charges can be found on the Student Financial Services' website at <https://www.cmu.edu/sfs/tuition/index.html>.

For estimated books and supplies, room and board, and personal/miscellaneous expenses view the cost of attendance for the Graduate program at <https://www.cmu.edu/sfs/tuition/graduate/index.html>.

#### Descriptions of Academic Programs

Information on the university's graduate academic programs and degree offerings is available from the various schools/colleges and admitting offices. Links to those programs can be found at <https://www.cmu.edu/academics/index.html>.

#### Faculty

Information on the university's faculty and instructional personnel is available from individual schools/colleges. This information can be found on the university's academics website at <https://www.cmu.edu/academics/index.html>.

#### Facilities & Services for Disabled Students

The Office of Disability Resources provides responsive and reasonable accommodations to students who self-identify as having a disability, including physical, sensory, cognitive and emotional disabilities. If you would like to learn more about the services and accommodations provided by the Office of Disability Resources, visit their website at



<https://www.cmu.edu/disability-resources/students/>. To discuss your accommodation needs, please email us at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) or call us at 412-268-6121 to set up an appointment.

### Student Privacy & FERPA

One of the most significant changes a parent or guardian experiences in sending a student to college is the difference in privacy standards for educational records. Carnegie Mellon values the student's right to privacy. The university adheres to a federal law called the Family Educational Rights and Privacy Act (also called FERPA or the Buckley Amendment) that sets privacy standards for student educational records and requires institutions to publish a compliance statement, including a statement of related institutional policies. For more detailed information, view the university's brochure at <https://www.cmu.edu/hub/privacy/ferpa-brochure.pdf>.

### Return to Title IV Funds Policy and Procedural Statement

#### Policy Reason

The U. S. Department of Education requires that the university determine the amount of Federal Title IV aid earned by a student who withdraws or fails to complete the period of enrollment. The university must determine the earned and unearned portions of Title IV aid as of the date the student ceased attendance based on the amount of time the student spent in attendance. Up through the 60% point in the period of enrollment, a pro rata schedule is used to determine the amount of Title IV funds the student has earned at the time of withdrawal. After the 60% point in the period of enrollment, a student has earned 100% of the Title IV funds he or she was scheduled to receive. For a student who withdraws after the 60% point-in-time, there are no unearned funds. Federal regulations can be found at:

Federal Student Aid Handbook, Volume 5

Chapter 1 Withdrawals and the Return of Title IV Funds 34 CFR 668.22

Policy and Procedural Statement

At Carnegie Mellon Title IV funds are awarded to a student under the assumption that the student will attend school for the entire period for which the assistance is awarded. When a student withdraws, the student may no longer be eligible for the full amount of Title IV funds that the student was originally scheduled to receive.

If a recipient of Title IV grant or loan funds withdraws from a school after beginning attendance, the amount of Title IV grant or loan assistance earned by the student must be determined. If the amount disbursed to the student is greater than the amount the student earned, the unearned funds must be returned. If the amount disbursed to the student is less than the amount the student earned, and for which the student is otherwise eligible, he or she is eligible to receive a Post-withdrawal disbursement of the earned aid that was not received.

Carnegie Mellon determines the Withdrawal Date and Date of Determination to complete the return calculation. A student's withdrawal date and date of determination varies depending on the type of withdrawal. When a student provides official notification to Carnegie Mellon through the Student Leave of Absence and Withdrawal Process, the withdrawal is defined as official withdrawal. When the student does not complete the Student Leave of Absence and Withdrawal

Process and no official notification is provided by the student it is considered an unofficial withdrawal.

#### Leave of Absence/Withdrawal Process

A student may leave Carnegie Mellon by either taking a leave of absence (leaving the university temporarily with the firm and stated intention of returning) or by withdrawing from the university (leaving the university with no intention of returning). Students choosing to take a leave of absence should first contact their academic advisor to discuss their plans while on leave and to work out any conditions that may be necessary for a smooth return to Carnegie Mellon. A student deciding to leave the university should take the following steps:

- Complete a Leave of Absence or Withdrawal Form.
- The form must include all necessary signatures or the process will not be completed.
- Return the completed form to the University Registrar's Office, 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213.

#### Determination of Withdrawal Date

##### Official Withdrawals (Notification Provided by the Student)

Those withdrawals defined as official are processed in accordance with federal regulations. The Office of the Registrar provides information that identifies which students have processed a Student Leave of Absence and Withdrawal Form for each semester. This information includes the Date of Withdrawal, the Date of Determination, Withdrawal/Leave Status (LA, LS, & W2) and the semester of attendance. This information is maintained in the student's academic file and in the university's Student Information System.

For students who notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is the earliest of:

- Date the student began the withdrawal or leave of absence process;
- Date the student notified his or her home department;
- Date the student notified the associate dean of his or her college; or
- Date the student notified the dean of students.

##### Unofficial Withdrawal (No Official Notification Provided by the Student)

For a student who withdraws without providing notification to Carnegie Mellon, the institution determines the withdrawal date using defined criteria. This category of withdrawals includes students that drop out and students that do not earn a passing grade.

To identify the unofficial withdrawals the Registrar develops a preliminary list of students that did not complete the semester by reviewing the final student grade reports. The list includes all students with: a) semester units carried, b) 0 semester units passed, c) 0 quality points earned, and d) 0.0 QPA. The Registrar contacts the academic divisions about each student to determine if the student actually completed the semester and earned the grades (0.0) or failed to complete the semester and did not notify the University of their status.

For students who do not notify the University of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is:

- The midpoint of the semester;
- The last date the student attended an academically-related activity such as an exam, Tutorial or study group, or the last day a student turned in a class assignment.

#### Date of Determination that the Student Withdrew

Carnegie Mellon is not required to take attendance and the Date of Determination that a student withdrew varies depending upon the type of withdrawal: Official or Unofficial.

For withdrawals where the student provided *Official Notification* the Date of Determination is: The student's withdrawal date, or the date of notification, whichever is later.

For withdrawals where the student did not provide *Official Notification* the Date of Determination is: The date the institution becomes aware the student has ceased attendance.

For a student who withdraws without providing notification to the institution, the institution must determine the withdrawal date no later than 30 days after the end of the enrollment period.

#### Calculation of Earned Title IV Assistance

The withdrawal date is used to determine the point in time that the student is considered to have withdrawn so the percentage of the period of enrollment completed by the student can be determined. The percentage of Title IV aid earned is equal to the percentage of the period of enrollment completed.

The amount of Title IV federal aid earned by the student is determined on a pro-rata basis up to the end of 60% of the semester. If the student completed 30% of a term, 30% of the aid originally scheduled to be received would have been earned. Once a student has completed more than 60% of a term, all awarded aid (100%) has been earned. The percentage of federal aid earned and the order in which the unearned aid is returned are defined by federal regulatory requirements.

The calculation of earned Title IV funds includes the following grant and loan funds if they were disbursed or could have been disbursed to the student for the period of enrollment for which the Return calculation is being performed:

- Pell Grant
- Iraq and Afghanistan Service Grant
- TEACH Grant (not available at Carnegie Mellon)
- FSEOG Grant
- Federal Direct Loan

#### Institutional Charges

Institutional charges are used to determine the portion of unearned Title IV aid that the school is responsible for returning. Carnegie Mellon ensures that all charges for tuition, fees, room and

board, as well as all other applicable institutional charges are included in the return calculation. Institutional charges do not affect the amount of Title IV aid that a student earns when he or she withdraws.

The institutional charges used in the calculation usually are the charges that were initially assessed the student for the period of enrollment. Initial charges are only adjusted by those changes the institution made prior to the student's withdrawal (for example, for a change in enrollment status unrelated to the withdrawal). If, after a student withdraws, the institution changes the amount of institutional charges it is assessing a student, or decides to eliminate all institutional charges, those changes affect neither the charges nor aid earned in the calculation.

#### Return of Unearned Funds to Title IV

If the total amount of Title IV grant and/or loan assistance that was earned as of the withdrawal date is less than the amount that was disbursed to the student, the difference between the two amounts will be returned to the Title IV program(s) and no further disbursements will be made.

If a student has received excess funds, the College must return a portion of the excess equal to the lesser of the student's institutional charges multiplied by the unearned percentage of funds, or the entire amount of the excess funds.

The funds will be returned in the order below as prescribed by federal regulations, within 45 days from the date of determination that a student withdrew.

- Unsubsidized Federal Stafford Loans
- Subsidized Federal Stafford Loans
- Federal PLUS loans
- Federal Pell Grants
- Federal Supplemental Educational Opportunity Grants (FSEOG)

#### Post-Withdrawal Disbursements

If the total amounts of the Title IV grant and/or loan assistance earned as of the withdrawal date is more than the amount that was disbursed to the student, the difference between the two amounts will be treated as a post-withdrawal disbursement. In the event that there are outstanding charges on the student's account, Carnegie Mellon will credit the student's account for all or part of the amount of the post-withdrawal disbursement up to the amount of the allowable charges.

Any amount of a post-withdrawal disbursement that is not credited to a student's account will be offered to the student within 30 days of the date that the institution determined that the student withdrew. Upon receipt of a timely response from the student, the College will disburse the funds within 90 days of the date of determination of the student's withdrawal date.

#### Return of Title IV Funds – Withdrawals for Programs Offered in Modules

The return of Title IV funds for programs offered in modules is defined in a separate policy statement at Carnegie Mellon. This document is included as an addendum to the Carnegie Mellon University Return to Title IV Funds Policy and Procedural Statement (see below).

### Policies and Procedures

Federal Student Aid Handbook, Volume 5, Chapter 2 Withdrawals and the Return of Title IV Funds  
CFR 668.22 (a), (f) and (l)

Dear Colleague Letter GEN-11-14 July 2011

For all programs offered in modules, a student is a withdrawal for Title IV purposes if the student ceases attendance at any point prior to completing the payment period or period of enrollment (unless the institution has written confirmation from the student that they will attend a module that begins later in the enrollment period).

The regulations require the institution to determine whether Title IV funds must be returned based on the number of days actually completed versus the number of days the student was scheduled to attend in the payment period. The regulations prevent students from enrolling in modules or compressed courses spanning the period, completing a portion of the period, and retaining all aid for the period.

A program is considered to be offered in modules if a course or courses in the program do not span the entire length of the payment period or period of enrollment. The rule impacts all programs offering courses shorter than an entire semester, including semester-based programs with a summer term consisting of two consecutive summer sessions.

The Student Financial Aid Office has established the following procedures associated with handling withdrawals from programs offered in modules. An Associate Director of Student Financial Aid has the primary responsibility for compliance and implementation of these regulatory requirements.

The institution will identify students enrolled for the summer session that are eligible for Title IV Aid.

- Pell eligible students are identified
- Students with summer loans are identified
- The period of enrollment and enrollment status will be identified for each student

All Leave/ Withdrawal Forms processed by the University Registrar's Office will be reviewed for the summer sessions to record the Withdrawal Date and Date of Determination to identify any student receiving federal funding.

The Student Financial Aid Office will identify any students that drop courses in the summer sessions.

- During Summer I this is standard procedure
- During Summer II this is reviewed after 10th day reporting
- Any additional dropped courses will be reviewed through the 60% enrollment period

Students who are identified as official withdrawals or that officially drop all courses in a session will be reviewed to determine the amount of federal financial aid earned. If a Return of Title IV aid is required, existing institutional procedures will be followed.

At the end of the enrollment period the institution will determine if any students are identified as 'unofficial withdrawals.' If a Return of Title IV aid is required, existing institutional procedures will be followed.

If a student does not begin courses in all sessions, a Return of Title IV aid may not be required, but other regulatory provisions concerning recalculation may apply.

If a student completes both courses in module one, but officially drops courses in module two while attending module one the student is not a withdrawal.

Since the enrollment is less than half time, the student is no longer eligible for the loan and the funds must be returned.

The following information obtained from the Federal Student Aid Handbook, Chapter 2, Withdrawals and the Return of Title IV Funds, will be used to determine whether a student enrolled in a series of modules is a withdrawal.

#### How to determine whether a student in a program offered in modules has withdrawn

Schools can determine whether a student enrolled in a series of modules is a withdrawal by asking the following questions.

1. *After beginning attendance in the payment period or period of enrollment, did the student cease to attend or fail to begin attendance in a course he or she was scheduled to attend?*

If the answer is no, this is not a withdrawal.

If the answer is yes, go to question 2.

2. *When the student ceased to attend or failed to begin attendance in a course he or she was scheduled to attend, was the student still attending any other courses?*

If the answer is yes, this is not a withdrawal; however other regulatory provisions concerning recalculation may apply.

If the answer is no, go to question 3.

3. *Did the student confirm attendance in a course in a module beginning later in the period (for non-term and nonstandard term programs, this must be no later than 45 calendar days after the end of the module the student ceased attending)?*

If the answer is yes, this is not a withdrawal, unless the student does not return.

If the answer is no, this is a withdrawal and the Return of Title IV Funds requirements apply.

#### *Contact*

Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412-268-1353.

## Satisfactory Academic Progress Policy and Procedural Statement

To be eligible for federal, state, and institutional financial aid, all students are required to maintain Satisfactory Academic Progress toward the completion of a degree. Each university determines its own policy in accordance with federal regulations set forth by the U. S. Department of Education regarding satisfactory progress standards to ensure student success. To maintain Satisfactory Academic Progress at Carnegie Mellon University, students must meet the following minimum standards for both of the qualitative (QPA) and quantitative (completion rate) measures:

Student Type	QPA (Qualitative)	Completion Rate (Quantitative)*
First Year Undergraduate	1.75	80%
Undergraduate Upper-class	2.00	80%
Heinz Graduate	3.00	80%
Other Graduate (excluding Tepper)	2.00	80%

*\*To calculate the completion rate, the cumulative number of completed units is divided by the cumulative number of units attempted. Advance Placement credits are excluded from both figures.*

In addition to the above mentioned Financial Aid Satisfactory Academic Progress standards, federal regulations require a student to complete their degree within a specified amount of time. The maximum timeframe cannot exceed 150 percent of the time published as needed for completion of the program.

Scope:

This policy applies to Federal aid including Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Work-Study, Federal Direct Loans, and Federal Direct PLUS Loan programs; state grant aid; and Carnegie Mellon institutional aid including grants, loans, and scholarships.

Federal regulations can be found at:

Federal Student Aid Handbook, Volume 1

Chapter 1 School Determined Requirements

34 CFR 668.16(e)

34 CFR 668.32(f)

34 CFR 668.34

Evaluation:

Carnegie Mellon evaluates all students for Financial Aid Satisfactory Academic Progress annually, at the end of the spring semester. Students that are included in the review are undergraduates, graduates, both full-time and part-time.

Courses that do not count toward a student's degree cannot be used to determine enrollment status for financial aid purposes. Carnegie Mellon will count transfer credit hours that are accepted toward a student's educational program as both attempted hours and completed hours. Advanced Placement Non-Degree and Non-Credit courses are not counted as units passed or attempted. When a course is repeated, all grades will be recorded on the official academic transcript and will be calculated in the student's QPA. For financial aid eligibility, only one repeat per course is permitted in the determination of enrollment status for courses previously passed.

If the student withdraws and is not assigned a W grade, then it will not be counted in the number of units attempted or completed. If the W grade is assigned, the units will be counted in the number of units attempted and will be counted as zero in the number of units completed.

If the student has incomplete units, the units will be counted as attempted and will be counted as zero in the number of units completed.

The Financial Aid Satisfactory Academic Progress evaluation is a cumulative review of all semesters, regardless of whether or not the student received financial aid during the academic year.

If the minimum requirements are not achieved, the student is ineligible to receive financial aid. In such a case, the student is notified and given an option to appeal their financial aid status. More information about the appeal process can be found at [www.cmu.edu/sfs/docs/federal-title-iv.pdf](http://www.cmu.edu/sfs/docs/federal-title-iv.pdf).

A financial aid package will not be completed unless an appeal is received, approved and processed accordingly. If by chance a financial aid package is processed and released to the student, it is conditional and subjected to financial aid removal until an appeal is received, approved and processed accordingly.

Contact:

Accountable Department: Enrollment Services, Student Financial Aid. Questions regarding this policy or its intent should be directed to the Student Financial Aid Office, phone: 412-268-1353.

#### Student Body Diversity

For Information about the diversity of the university student body, contact the Institutional Research and Analysis Office, <https://www.cmu.edu/ira/index.html>.

For information about the University's Diversity, Equity and Inclusion initiative, visit the Center for Student Diversity and Inclusion's website at <https://www.cmu.edu/student-diversity/>.

#### Written Arrangement Information

A U.S. Department of Education regulation requires disclosure of specific information to prospective and current students regarding written arrangements between Carnegie Mellon University (CMU) and any institution(s) that provides a portion of an educational program to



students enrolled at CMU. CMU enters into such arrangements to enrich the educational experiences offered to its students. In accordance with the regulation, CMU provides this information at <http://www.cmu.edu/hub/consumer-information/docs/written-arrangement.pdf>.

### Student Complaints & Consumer Information by State

As required for compliance with U.S. Federal Program Integrity Regulations, state official/agency contact information for each U.S. state/territory that could handle a student's complaint is provided at <https://www.cmu.edu/hub/consumer-information/docs/complaints.pdf>.

### Gainful Employment Disclosures

As required by U.S. Department of Education regulations Gainful Employment Disclosures (Disclosures about CMU certificate programs that prepare students for specific occupations) can be found at <https://www.cmu.edu/hub/consumer-information/>.

### Information about Student Financial Aid:

Meeting the cost of higher education is a significant investment. We are committed to providing a comprehensive financial aid program that makes it possible for admitted students to attend Carnegie Mellon.

### Application Process & Timeline:

Graduate Students: **To apply for financial aid for the 2021-2022 academic year, follow the steps below.**

#### Free Application for Federal Student Aid (FAFSA)

The FAFSA is required if applying for federal financial aid programs. There are now two ways to complete the *Free Application for Federal Student Aid (FAFSA)* form: a redesigned <https://studentaid.ed.gov/sa/fafsa> website or a mobile app (available through Google Play, <https://play.google.com/store/apps/details?id=com.fsa.mystudentaid> or the Apple App Store, <https://itunes.apple.com/us/app/mystudentaid/id1414539145>).

We recommend using the IRS Data Retrieval Tool (DRT) (<https://studentaid.ed.gov/sa/resources/irs-drt-text>) to complete the FAFSA. The DRT transfer process has been improved to include stronger security and privacy protections; therefore, tax information transferred will not display on the form or Student Aid Report. Instead, the phrase "Transferred from the IRS" will appear in the fields.

Those selected for federal verification after FAFSA completion or those unable to use the IRS DRT will need to request an IRS Tax Return Transcript (<https://www.irs.gov/individuals/get-transcript>).

#### Additional information:

Apply as soon as possible after October 1.

Carnegie Mellon's federal code is 003242.

Use 2018 tax information to complete the FAFSA.

A Department of Education Federal Student Aid (FSA) ID is required. View FSA ID instructions at <https://fsaid.ed.gov/npas/index.htm>.

Students must complete the FAFSA's electronic signature requirement.

### MPN & Entrance Counseling

All first-time Federal Direct Loan borrowers are required to complete entrance counseling. The entrance counseling session provides information about borrower rights and responsibilities. CMU will be notified when a student has completed online entrance counseling. Funds will not be disbursed until the entrance counseling session has been completed. Students who completed a federal entrance counseling session while at CMU, do not have to complete another session.

Additional information:

View entrance counseling instructions (<https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/mpn-entrance-counseling.html>).

Complete entrance counseling session at <https://studentloans.gov>.

### Grad PLUS Loan

If you plan on borrowing a Federal Direct Graduate PLUS Loan, this is a two-part process and both parts must be completed in order for your loan to be originated. If you borrowed a Grad PLUS Loan last academic year, you are only required to complete the application portion of the process. The application portion of the process cannot be completed before June 1, 2019.

Additional information:

View detailed Grad PLUS Loan instructions at <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/plus/instructions.html>.

The two-part process may be completed at <https://studentloans.gov>.

### Financial Aid Eligibility Notification

Once a student completes all of the steps above, a financial aid package will be determined. The Student Financial Aid Office will notify the student by email that a financial aid award letter has been posted to SIO (<https://s3.andrew.cmu.edu/sio/index.html#finances-home>). The letter contains information and further instructions regarding the student's eligibility and awards. If a student's circumstances change, then financial aid eligibility will be re-evaluated and the student will receive notification that a revised award letter is available in SIO.

### Missing Documents

If we are unable to process a student's financial aid package due to missing documents, a Financial Aid Alert email will be sent to the student requesting the required documents by a specified date. Until the entire application process is completed and all required documents are submitted, our office may be unable to complete a student's financial aid package. Students may log in to SIO (<https://s3.andrew.cmu.edu/sio/index.html#finances-home>) to view documents

that have been received by our office. [View instructions](https://www.cmu.edu/sfs/financial-aid/missing-documents/index.html) for submitting missing documents at <https://www.cmu.edu/sfs/financial-aid/missing-documents/index.html>.

### Teacher Certification

Teacher certification students at the graduate level should be aware that federal regulations classify them as a grade level 5 undergraduate student for Federal Direct Student Loan purposes. Teacher certification students are, however, considered a graduate student by Carnegie Mellon for academic purposes.

### Available Financial Aid

#### Scholarships & Grants

##### Graduate Students:

Graduate students interested in scholarships and grants may contact their program of interest or department. View more information on the Graduate Education Office website, <http://www.cmu.edu/graduate/prospective-students/index.html>. In addition, the Fellowships & Scholarships Office (<http://www.cmu.edu/fso/>) provides support to graduate students interesting in pursuing certain external scholarships, like Fulbright and UK Awards.

### Federal Work-Study

Federal Work-Study (FWS) is a need-based self-help award. If a student has been awarded FWS, the FWS award is the total that can be earned during the academic year as a work-study student.

### Federal Loans

For many students and families, educational loans are a necessary part of the process of paying for college. Student Financial Aid certifies loans for students, as well as Federal Direct Parent PLUS Loans for parents of undergraduates and Federal Direct Grad PLUS Loans for graduate students.

### Federal Direct Student Loan

The Federal Direct Student Loan is the most widely-used loan for college students and is available to both undergraduate and graduate students. There are two types of Federal Direct Student Loans, subsidized and unsubsidized, and eligibility for both is determined by completing the FAFSA.

### Grad PLUS Loan

Eligible graduate students may borrow a Federal Direct Grad PLUS Loan to assist with educational expenses. Students may borrow any amount up to their calculated cost of attendance minus any other aid received.

### Private Loans

Private loan programs offer competitive interest rates and borrower benefits. To increase chances of approval and possibly improve the rate you receive, students are strongly recommended to apply with a creditworthy co-signer.

### Student Outcomes

### Retention and Graduation Rates

Institutional Research and Analysis Office offers up-to-date data on degrees conferred, enrollment reports, freshmen retention rates and race and ethnicity reports for annual degrees. Retention and Graduation rates can be found at <https://www.cmu.edu/ira/retentiongradrates.html>.

### Intercollegiate Athletic Program Participation Rates and Financial Support Data (Equity in Athletics Disclosure Act)

Please visit the U.S. Department of Education's site, The Equity in Athletics Data Analysis (<http://ope.ed.gov/athletics/#/>) and select the "Get data for one schools" option. Enter "Carnegie Mellon University" in the "Name" field and select the "Continue" button at the bottom of the page.

A printed copy of the report can be requested by calling the Department of Athletics, Physical Education, and Recreation at 412-268-8054 or by sending an email to Josh Centor, Associate Vice President for Student Affairs and Director of Athletics, Physical Education & Recreation, at [jcentor@andrew.cmu.edu](mailto:jcentor@andrew.cmu.edu).

### Health and Safety

#### Drug and Alcohol Abuse Prevention Program

Under the Drug Free Workplace Act of 1988 and the Drug Free Schools and Campuses Act of 1989, the Carnegie Mellon University is required to have an alcohol and other drug policy outlining prevention, education and intervention efforts and consequences for policy violations. The policy can be found at <https://www.cmu.edu/policies/administrative-and-governance/alcohol-and-drug-policy.html>.

#### CMU Annual Security and Fire Safety Report

A printed copy of the report can be requested by contacting University Police at 412-268-6232 or [campuspd@andrew.cmu.edu](mailto:campuspd@andrew.cmu.edu).

The annual security and fire safety report (Carnegie Mellon University Police Department Annual Reports) is also available online at <http://www.cmu.edu/police/security-fire-reports/index.html>.

#### Vaccination Policies

CMU Prematriculation Immunization Policy can be found at <http://www.cmu.edu/policies/student-and-student-life/immunizations.html>.

CMU University Health Services Health Requirements for Incoming Students can be found at <https://www.cmu.edu/health-services/new-students/>.

### Other Information

#### Voter Registration

Please visit <http://www.usa.gov/Citizen/Topics/Voting/Register.shtml>.

#### Carnegie Mellon Ethics Hotline

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity relating to financial matters, academic and student life, human relations, health and campus safety or research.

Students, faculty and staff can anonymously file a report by calling 877-700-7050 or visiting [www.reportit.net](http://www.reportit.net) (user name: tartans; password: plaid). All submissions will be reported to appropriate university personnel.

*The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.*

#### Statement of Assurance

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the vice president for campus affairs, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.



5000 Forbes Avenue

Pittsburgh, PA 15213

[www.ece.cmu.edu](http://www.ece.cmu.edu)

@CMU\_ECE

# INI Pittsburgh - Silicon Valley School Catalog

*Academic Year 2024 (August 26, 2024 to May 11, 2025) as defined by the Official Academic Calendar at <https://www.cmu.edu/hub/calendar/docs/2425-academic-calendar-list-view.pdf>*

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# Campus Information

## Standard Disclosure

Carnegie Mellon University (CMU) is a private, non-profit institution, approved to operate in California by the California Bureau for Private Postsecondary Education. Approval to operate means compliance with state standards as set forth in the California Private Postsecondary Education Act of 2009. CMU is accredited through a voluntary, peer-review process coordinated by the Middle States Commission on Higher Education (MSCHE or Middle States). MSCHE is one of six regional accrediting agencies in the United States, each accrediting institutions of higher education within a specific geographic region. Middle States is recognized by the U.S. Department of Education. This recognition enables MSCHE's member institutions to establish eligibility to participate in federal financial aid programs (e.g., federal loans, grants, and work-study) administered by the U.S. Department of Education. CMU has been accredited by Middle States since 1921. More information regarding accreditation standards and processes and to view the University's re-accreditation reports on the Middle States Accreditation website at: <http://www.cmu.edu/middlestates/>.

Any questions a student may have regarding this catalog that have not been satisfactorily answered by the institution may be directed to the Bureau for Private Postsecondary Education at 1747 N. Market Boulevard, Suite 225, Sacramento, CA 95834, P.O. Box 980818, West Sacramento, CA 95798-0818, [www.bppe.ca.gov](http://www.bppe.ca.gov), toll-free telephone number (888) 370-7589 or by fax (916) 263-1897.

As a prospective student, you are encouraged to review this catalog prior to signing an enrollment agreement. You are also encouraged to review the School Performance Fact Sheet, which must be provided to you prior to signing an enrollment agreement.

A student or any member of the public may file a complaint about this institution with the Bureau for Private Postsecondary Education by calling (888) 370-7589 toll-free or by completing a complaint form, which can be obtained on the bureau's internet website at [www.bppe.ca.gov](http://www.bppe.ca.gov).

## Carnegie Mellon University – Information Networking Institute

4616 Henry Street  
Pittsburgh, PA 15213  
Phone:(412) 268-7195; Fax: (412) 268-7196  
<https://www.cmu.edu/ini/>

## Branch Campus: Carnegie Mellon University – Silicon Valley

NASA AMES RESEARCH PARK, MS 23-11  
Moffett Field, CA 94035  
Phone: (650) 335-2886; Fax (650) 603-7032  
[www.cmu.edu/silicon-valley/](http://www.cmu.edu/silicon-valley/)

## **Class Location**

Classes offered for these INI Pittsburgh - Silicon Valley programs in California:

MSIT-IS  
MSIT-IS - Applied Study  
MSIT-IS - Advanced Study  
MSIT-IS - Applied Advanced Study  
MSMITE  
MSMITE – Applied Study  
MSMITE – Advanced Study  
MSMITE – Applied Advanced Study

are held at:

Branch Campus: Carnegie Mellon University - Silicon Valley  
NASA AMES RESEARCH PARK, MS 23-11  
Moffett Field, CA 94035  
Phone: (650) 335-2886; Fax (650) 603-7032  
[www.cmu.edu/silicon-valley/](http://www.cmu.edu/silicon-valley/)

## **INI Website California Private Postsecondary Education Act Section**

The INI Pittsburgh-Silicon Valley School Catalog along with all other relevant documents and information is available under the California Private Postsecondary Education Act section on the INI website at <https://www.cmu.edu/ini/academics/bicoastal/bppeact.html>.

## **Office of Student Assistance and Relief**

The Office of Student Assistance and Relief is available to support prospective students, current students, or past students of private postsecondary educational institutions in making informed decisions, understanding their rights, and navigating available services and relief options. The office may be reached by calling (888) 370-7589, option #5, or by visiting [osar.bppe.gov](http://osar.bppe.gov)

# Welcome to the INI

The Information Networking Institute (INI) at Carnegie Mellon University (CMU) educates and develops engineers through technical, interdisciplinary master's degree programs in information networking, security and mobile and Internet of Things (IoT) engineering that incorporate business and policy perspectives.

With extraordinary agility, the INI has navigated the changing landscape of technology from wired communications in the 1980s to wireless, mobile and IoT in today's world. We were established in 1989 in response to a demand from industry for professionals skilled in both computing and communications. Looking at first principles in each of those domains, we designed a program that would prepare students for the world we saw coming in which distributed computing and communications would be indistinguishable.

What began as a small fledgling program has evolved over the past three decades to become an integral part of Carnegie Mellon's College of Engineering and home to nearly 300 students each year from around the world. Our students are provided with a distinctly interdisciplinary learning experience through an advanced, specialized curriculum in information networking and computer systems, complemented by coursework in business, management, and policy.

## The INI Mission

We design and deliver exceptional, world-class engineering master's degree programs and transformative learning experiences enriched with diverse perspectives. The INI equips our graduates with distinct interdisciplinary knowledge and skills that set them apart from their peers.

## The INI Vision

Our graduates are driving innovation and having a positive impact on the world.

## The INI Values

**Interdisciplinarity:** We empower the next generation of leaders through programs developed by our world-class faculty who bring a rich set of perspectives and experiences from across disciplines. The INI curriculum is complemented by meta-curricular activities to offer a framework for students to create their own paths.

**Innovation:** We evolve and adapt as our changing world demands by giving our faculty, students and staff the resources to investigate, the freedom to experiment and the encouragement to excel. As an organization, we are always innovating, adapting our curriculum and co-curricular activities to maintain relevance amidst rapid change.

**Resilience:** As we near the INI's 35th anniversary, we're proud to reflect on the ways we've grown. Our network of changemakers and collaborators has been our driving force in ensuring

the success of our students, faculty, and alumni. Our adaptability has solidified our place as a leader in education innovation.

**Inclusivity:** Our people are our greatest asset. We provide a welcoming culture that cultivates inclusivity and values a diversity of opinions, intellectual perspectives and life experiences from all people while celebrating their ethnic origin, race, religion, gender, age, physical ability, sexual orientation, self-identity, and neurodiversity. Members of the INI community value, respect and trust one another, as evidenced by what we say and, more importantly, by what we do.

**Wellness:** We encourage our staff, faculty and students to prioritize their physical and mental health. By attending to our well-being, we show up with a full cup, primed and ready to be of service to others.

## **The CMU Mission**

To create a transformative educational experience for students focused on deep interdisciplinary knowledge; problem-solving; leadership, communication and interpersonal skills; and personal health and well-being.

To cultivate a transformative university community committed to (a) attracting and retaining diverse, world-class talent; (b) creating a collaborative environment open to the free exchange of ideas, where research, creativity, innovation and entrepreneurship can flourish; and (c) ensuring individuals can achieve their full potential.

To impact society in a transformative way - regionally, nationally and globally - by engaging with partners outside the traditional borders of the university campus.

## **Programs Offered**

Through bicoastal delivery in collaboration with the Silicon Valley campus, the INI offers the following programs:

M.S. in Information Technology-Information Security (MSIT-IS)

M.S. in Information Technology-Information Security – Applied Study (MSIT-IS Applied Study)

M.S. in Information Technology-Information Security – Advanced Study (MSIT-IS Advanced Study)

M.S. in Information Technology-Information Security – Applied Advanced Study (MSIT-IS Applied Advanced Study)

M.S. in Mobile and IoT Engineering (MSMITE)

M.S. in Mobile and IoT Engineering – Applied Study (MSMITE Applied Study)

M.S. in Mobile and IoT Engineering – Advanced Study (MSMITE Advanced Study)

M.S. in Mobile and IoT Engineering – Applied Advanced Study (MSMITE Applied Advanced Study)

These technical, interdisciplinary graduate degree programs provide students with an advanced, specialized curriculum combining computer science, electrical and computer engineering, software engineering, and information systems. It also exposes students to topics in business, management, and policy. The unique combination of rigorous technical topics, practical industry-oriented topics, and real-world project experience empowers students to be the movers and shakers of the tech industry, whether launching a tech start-up, joining an enterprise R&D team, or fighting cyber-crime.

### **Classification of Instructional Programs (CIP) and Standard Occupational Classification (SOC) Codes**

The CIP code and corresponding SOC codes for the MIST-IS, MSIT-IS Applied, MSIT-IS Advanced and MSIT-IS Applied Advanced programs are:

11.1003	Computer and Information Systems Security/Auditing/Information Assurance.	11-3021	Computer and Information Systems Managers
		15-1212	Information Security Analysts
		15-1231	Computer Network Support Specialists
		15-1241	Computer Network Architects
		15-1242	Database Administrators
		15-1243	Database Architects
		15-1244	Network and Computer Systems Administrators

The CIP code and corresponding SOC codes for the MSMITE, MSMITE Applied, MSMITE Advanced and MSMITE Applied Advanced programs are:

11.0901	Computer Systems Networking and Telecommunications.	11-3021	Computer and Information Systems Managers
		15-1211	Computer Systems Analysts
		15-1212	Information Security Analysts
		15-1231	Computer Network Support Specialists
		15-1241	Computer Network Architects
		25-1021	Computer Science Teachers, Postsecondary

## **MSIT-IS**

The MSIT-IS program prepares students to become industry leaders in information security by blending education in information security technology with other topics essential for the effective development and management of secure information systems.

### **Program Learning Outcomes**

*Students who graduate from the MSIT-IS program gain an ability to:*

- Demonstrate knowledge and skills related to security and privacy principles and state-of-the-art techniques for security and privacy in information systems including devices, networks, software, and services
- Evaluate trade-offs between technical security and privacy solutions and potential business and economic impacts
- Design and implement secure systems and services by applying knowledge and skills in information security and privacy
- Demonstrate the ability to scope, formalize, and execute practical team projects

Detailed outline of the requirements for completion of the INI Pittsburgh - Silicon Valley MSIT - IS program, including required courses, required internships, and the total number of units required for completion is provided below.

### **MSIT-IS Curriculum and Requirements**

The curriculum consists of the following main components: core courses, program electives, practicum and study option requirements (if applicable).

The core courses establish the necessary background and a common competency level. The program elective units build upon the core, providing flexibility and breadth in coursework.

The capstone experience is the practicum, which requires students to apply their knowledge and skills to solve a real-world problem.

All students starting an INI degree program in Spring 2021 and beyond will select one of four new study options: Standard option (123 units total), Applied option (129 units), Advanced Studies option (159 units), and Applied Advanced Studies option (165 units). Curricular requirements and program duration will depend on which study option they choose (see chart below).

## MSIT-IS Study Option Program Curriculum

MSIT-IS STUDY OPTIONS			BREAKDOWN OF UNITS
Standard [123 Units]	3 Semesters	Elective Internship	<ul style="list-style-type: none"> <li>○ Core [75 Units]</li> <li>○ Electives [48 Units]</li> </ul>
Applied [129 Units]	3 Semesters	Required Internship	<ul style="list-style-type: none"> <li>○ Core [72 Units]</li> <li>○ Electives [24 Units]</li> <li>○ Practicum [24 Units]</li> <li>○ Internship [3 Units]</li> <li>○ APD 1 [3 Units]</li> <li>○ APD 2 [3 Units]</li> </ul>
Advanced Studies [159 Units]	4 Semesters	Elective Internship	<ul style="list-style-type: none"> <li>○ Core [75 Units]</li> <li>○ Electives [48 Units]</li> <li>○ Advanced Studies [36 Units] - Research Thesis or Area of Concentration</li> </ul>
Applied Advanced Studies [165 Units]	4 Semesters	Required Internship	<ul style="list-style-type: none"> <li>○ Core [72 Units]</li> <li>○ Electives [24 Units]</li> <li>○ Practicum [24 Units]</li> <li>○ Advanced Studies [36 Units] - Research Thesis or Area of Concentration</li> <li>○ Internship [3 Units]</li> <li>○ APD 1 [3 Units]</li> <li>○ APD 2 [3 Units]</li> </ul>

### Core Courses [72-78 units]

#### NETWORKING CORE (12 UNITS):

- Choose One:
  - 14-740: Fundamentals of Telecommunications and Computer Networks
  - 14-760: Advanced Real-World Data Networks
  - 18-756: Packet Switching and Computer Networks
  - 15-641: Networking and the Internet

#### ADDITIONAL MSIT-IS CORE (12 UNITS):

- Choose One:
  - 14-828: Browser Security
  - 14-761: Applied Information Assurance
  - 14-829: Mobile and IoT Security

SECURITY CORE (12 UNITS):

- 14-741: Introduction to Information Security

BUSINESS & MANAGEMENT CORE (12 UNITS):

Choose one:

- 14-817: Cyber Risk Modeling

OR both of:

- 14-782: Information Security Risk Management I (6 units)
- 14-788: Information Security Policy and Management (6 units)

PRACTICUM (24 units):

- 14-798: [INI Practicum Project](#)

ACADEMIC & PROFESSIONAL DEVELOPMENT 1 (3 units)

- 14-601: Academic & Professional Development 1 (3 Units)

Program Electives [48 Units]

**36 units** Fulfilled by courses in INI, Electrical and Computer Engineering (ECE), School of Computer Science (SCS), Engineering & Public Policy (EPP), Entertainment Technology Center (ETC) or Integrated Innovation Institute (III), and/or approved courses in the Heinz College or Tepper School. Some exceptions apply.

**12 units** of restricted electives.

Academic & Professional Development 2\* [3 units]

\*Applied and Applied Advanced Studies options only

Internship\* [3 Units]

\*Applied and Applied Advanced Studies options only

Residency Requirement [0 Units]

All students must fulfill a residency requirement for a semester in which they are enrolled at CMU Silicon Valley.

**MSIT-IS Restricted Electives (Last updated: May 22, 2023)**

This list provides courses that have been approved by the department for MSIT-Information Security students.

**The INI cannot guarantee that courses will be offered each semester or in a specific semester as advertised below. Likewise, the location listed is not guaranteed as campus course offerings constantly change.** Students must refer to the 'Schedule of Classes' to determine course availability. In addition, the INI cannot guarantee that a student will be offered a seat in a specific course. These apply to courses at the INI as well as other departments at Carnegie Mellon. Students should always register under the INI course number (14-XXX) if a



course is cross-listed with other departments. The numbers for cross-listed courses are provided to the right of the course titles below.

**Please note: Course numbers and titles may change. If you notice such a change, please email [ini-academic@andrew.cmu.edu](mailto:ini-academic@andrew.cmu.edu) prior to enrolling in a course.**

05-836 Usable Security and Privacy (PIT, 12 units) (cross-listed 17-734)  
14-684: Cyber Law and Ethics (PIT & Broadcast to SV, 6 units)  
14-735 Secure Coding (PIT & Broadcast to SV, 12 units)  
14-742 Security in Networked Systems (SV & Broadcast to PIT, 12 units)  
14-757: Introduction to Adversarial Machine Learning (SV & Broadcast to PIT, 12 units)  
14-761 Applied Information Assurance (PIT, 12 units)  
14-782 Information Security Risk Management I (PIT, 6 units)  
14-788 Information Security Policy and Management (PIT, 6 units)  
14-795: AI Applications in Information Security (PIT & Broadcast to SV, 12 units)  
14-817 Cyber Risk Modeling (SV & Broadcast to PIT, 12 units)  
14-819 Introduction to Software Reverse Engineering (PIT & Broadcast to SV, 12 units)  
14-822 Host-Based Forensics (PIT & Broadcast to SV, 12 units)  
14-823 Network Forensics (PIT & Broadcast to SV, 12 units)  
14-828 Browser Security (PIT & Broadcast to SV, 12 units)  
14-829 Mobile and IoT Security (SV & Broadcast to PIT, 12 units)  
14-850 INSuRE Cybersecurity Research (SV & Broadcast to PIT, 12 units)  
15-856 Introduction to Cryptography (PIT, 12 units)  
17-735 Engineering Privacy in Software (PIT, 12 units) (cross-listed 19-605, 95-878)  
18-632 Introduction to Hardware Security (PIT & Broadcast to SV, 12 units)  
18-731 Network Security (PIT & Broadcast to SV, 12 units)  
18-732 Secure Software Systems (PIT & Broadcast to SV, 12 units)  
18-733 Applied Cryptography (PIT & Broadcast to SV, 12 units)  
18-734 Foundations of Privacy (PIT & Broadcast to SV, 12 units) (cross-listed 17-731)  
19-608 Privacy, Policy, Law, and Technology (PIT, 12 units) (cross-listed 17-733 & 95-818)  
19-733 Cryptocurrencies, Blockchains and Applications (PIT, 12 units) (cross-listed 17-703)  
94-806 Privacy in the Digital Age (PIT, 6 units) 95-746: Cloud Security (PIT, 6 units)  
95-883 Ethical Penetration Testing (PIT, 6 units)

**PIT: CMU Campus in Pittsburgh, PA**

**SV: CMU Campus in Silicon Valley, CA**

**When enrolled in courses that are broadcasted students at both locations attend the classes synchronously.**

The MSIT-IS MS36 Curriculum is also available on the INI website at:

[https://www.cmu.edu/ini/academics/bicoastal/curriculum\\_msit-is\\_ms36.html](https://www.cmu.edu/ini/academics/bicoastal/curriculum_msit-is_ms36.html)

## **MSMITE**

The MSMITE program prepares students to be at the forefront of the mobile and IoT engineering field with a multidisciplinary curriculum spanning both technical and business topics in mobile applications, services and devices.

### **Program Learning Outcomes**

Students gain the ability to:

- Demonstrate knowledge and skills regarding processing on constrained hardware, designing software for embedded computing, application delivery, and user interactions
- Critically analyze historical and state-of-the-art mobile and IoT technologies relating to devices, networks, providers, data, and applications to identify trade-offs and develop design principles
- Apply mobile and embedded system skills and principles toward the design and development of products and services across a variety of vertical markets
- Evaluate trade-offs between technology solutions and potential business and economic impacts that influence or are influenced by mobile and IoT systems
- Demonstrate the ability to scope, formalize, and execute practical team projects

### **MSMITE Curriculum and Requirements**

The curriculum consists of the following main components: core courses, program electives, practicum and study option requirements (if applicable).

The core courses establish the necessary background and a common competency level. The program elective units build upon the core, providing flexibility and breadth in coursework.

The capstone experience is the practicum, which requires students to apply their knowledge and skills to solve a real-world problem.

All students starting an INI degree program in Spring 2021 and beyond will select one of four new study options: Standard option (123 units total), Applied option (129 units), Advanced Studies option (159 units), and Applied Advanced studies option (165 units). Curricular requirements and program duration will depend on which study option they choose (see chart below).

## MSMITE Study Option Program Curriculum

MSMITE STUDY OPTIONS			BREAKDOWN OF UNITS
Standard [123 Units]	3 Semesters	Elective Internship	<ul style="list-style-type: none"> <li>○ Core [75 Units]</li> <li>○ Electives [48 Units]</li> </ul>
Applied [129 Units]	3 Semesters	Required Internship	<ul style="list-style-type: none"> <li>○ Core [72 Units]</li> <li>○ Electives [24 Units]</li> <li>○ Practicum [24 Units]</li> <li>○ Internship [3 Units]</li> <li>○ APD 1 [3 Units]</li> <li>○ APD 2 [3 Units]</li> </ul>
Advanced Studies [159 Units]	4 Semesters	Elective Internship	<ul style="list-style-type: none"> <li>○ Core [75 Units]</li> <li>○ Electives [48 Units]</li> <li>○ Advanced Studies [36 Units] - Research Thesis or Area of Concentration</li> </ul>
Applied Advanced Studies [165 Units]	4 Semesters	Required Internship	<ul style="list-style-type: none"> <li>○ Core [72 Units]</li> <li>○ Electives [24 Units]</li> <li>○ Practicum [24 Units]</li> <li>○ Advanced Studies [36 Units] - Research Thesis or Area of Concentration</li> <li>○ Internship [3 Units]</li> <li>○ APD 1 [3 Units]</li> <li>○ APD 2 [3 Units]</li> </ul>

### Core Courses [72-78 units]

#### NETWORKING CORE (12 UNITS):

- Choose One:
  - 14-740: Fundamentals of Telecommunications and Computer Networks
  - 14-760: Advanced Real-World Data Networks
  - 18-756: Packet Switching and Computer Networks
  - 15-641: Networking and the Internet

#### ADDITIONAL MSMITE CORE (12 UNITS):

- Choose One:
  - 14-642: Introduction to Embedded Systems
  - 14-744: Mobile and Embedded Software Design
  - 14-829: Mobile and IoT Security

SECURITY CORE (12 UNITS):

- Choose One:
  - 14-741: Introduction to Information Security
  - 14-735: Secure Coding

BUSINESS & MANAGEMENT CORE (12 UNITS):

- 14-776: Fundamentals of Business and Management

PRACTICUM (24 UNITS):

- 14-798: [INI Practicum Project](#)

ACADEMIC & PROFESSIONAL DEVELOPMENT 1 (3 UNITS):

- 14-601: Academic & Professional Development 1

Program Electives [48 Units]

**36 units** Fulfilled by courses in INI, Electrical and Computer Engineering (ECE), School of Computer Science (SCS), Engineering & Public Policy (EPP), Entertainment Technology Center (ETC) or Integrated Innovation Institute (III), and/or approved courses in the Heinz College or Tepper School. Some exceptions apply.

**12 units** of restricted electives.

Academic & Professional Development 2\* [3 units]

\*Applied and Applied Advanced Studies options only

Internship\* (3 Units)

\*Applied and Applied Advanced Studies options only

Residency Requirement [0 Units]

All students must fulfill a residency requirement for a semester in which they are enrolled at CMU Silicon Valley.

**MSMITE Restricted Electives (Last updated May 22, 2023)**

This list provides MSMITE courses that have been approved by the department. **The INI cannot guarantee that courses will be offered each semester or in a specific semester as advertised below. Likewise, the location listed is not guaranteed as campus course offerings constantly change.** Students must refer to the 'Schedule of Classes' to determine course availability. In addition, the INI cannot guarantee that a student will be offered a seat in a specific course. These apply to courses at the INI as well as other departments at Carnegie Mellon. Students should always register under the INI course number (14-XXX) if a course is cross-listed with other

departments. The numbers for cross-listed courses are provided to the right of the course titles below.

***Please note: Course numbers and titles may change. If you notice such a change, please email [ini-academic@andrew.cmu.edu](mailto:ini-academic@andrew.cmu.edu) prior to enrolling in a course.***

05-670: Digital Service Innovation (PIT, 12 units)  
05-833: Gadgets, Sensors & Activity Recognition in HCI (PIT, 12 units)  
05-872: Rapid Prototyping of Computer Systems (PIT, 12 units, cross-listed 18-745, 39-648)  
11-777: Multimodal Machine Learning (PIT, 12 units)  
14-642: Fundamentals of Embedded Systems (SV & Broadcast to PIT, 12 units)  
14-736: Distributed Systems: Techniques, Infrastructure and Services (SV & Broadcast to PIT, 12 units)  
14-742: Security in Networked Systems (SV & Broadcast to PIT, 12 units)  
14-744: Mobile and Embedded Software Design (SV & Broadcast to PIT, 12 units)  
14-757: Introduction to Adversarial Machine Learning (SV & Broadcast to PIT, 12 units)  
14-760: Advanced Real-World Data Networks (SV & Broadcast to PIT, 12 units)  
14-763: Systems and Toolchains for AI Engineering (PIT & Broadcast to SV, 12 units)  
14-829: Mobile and IoT Security (SV & Broadcast to PIT, 12 units)  
14-848: Cloud Infrastructure and Services (PIT & Broadcast to SV, 12 units)  
14-795: AI Applications in Information Security (PIT & Broadcast to SV, 12 units)  
15-619: Cloud Computing (PIT & SV Remote), 15 units)  
15-624: Logical Foundations of Cyber-Physical Systems (PIT, 12 units) (cross-listed 15-824)  
15-640: Distributed Systems (PIT, 12 units)  
15-719: Advanced Cloud Computing (PIT, 12 units) (cross-listed 18-709)  
15-821: Mobile and Pervasive Computing (PIT, 12 units) (cross-listed 18-843)  
16-720: Computer Vision (PIT, 12 units)  
16-722: Sensing and Sensors (PIT, 12 units)  
17-645: Machine Learning in Production (PIT, 12 units)  
17-722: Building User-focused Sensing Systems (PIT, 12 units)  
17-728: Machine Learning and Sensing (PIT, 12 units)  
17-781: Mobile and IoT Computing Services (PIT, 12 units)  
18-731: Network Security (PIT & Broadcast to SV, 12 units)  
18-732: Secure Software Systems (PIT & Broadcast to SV, 12 units)  
18-759: Wireless Networks (PIT, 12 units)  
49-788: Mobile Apps for the Internet of Things (SV, 12 units)

**PIT: CMU Campus in Pittsburgh, PA**  
**SV: CMU Campus in Silicon Valley, CA**

**When enrolled in courses that are broadcasted students at both locations attend the classes synchronously.**

The MS36 Curriculum is also available on the INI website at:  
[https://www.cmu.edu/ini/academics/bicoastal/curriculum\\_msmite\\_ms36.html](https://www.cmu.edu/ini/academics/bicoastal/curriculum_msmite_ms36.html)

## **INI Courses**

### **14-601: INI Academic and Professional Development (3 units)**

This course, the first of two required for all first year INI students, will provide a foundation for essential academic and professional skills. It targets preparation for success, focusing on INI students' academic endeavors for lifelong learning and the enhancement of their professional lives. This course will provide students the best skills and tools to succeed in their academic endeavors, including awareness of research opportunities and knowledge and expertise in obtaining key professional and non-technical skills critical for global career success. Attendance and participation are required components of the course, and students who miss a class period for any reason will be required to submit extra work (e.g., a written report, a recorded presentation) demonstrating mastery of topics from that class period.

PREREQUISITES: None

### **14-642: Introduction to Embedded Systems (12 units)**

This practical, hands-on course introduces students to the basic building-blocks and the underlying scientific principles of embedded systems. The course covers both the hardware and software aspects of embedded processor architectures, along with operating system fundamentals, such as virtual memory, concurrency, task scheduling and synchronization. Through a series of laboratory projects involving state-of-the-art processors, students will learn to understand implementation details and to write assembly-language and C programs that implement core embedded OS functionality, and that control/debug features such as timers, interrupts, serial communications, flash memory, device drivers and other components used in typical embedded applications. Relevant topics, such as optimization, profiling, digital signal processing, feedback control, real-time operating systems and embedded middleware, will also be discussed.

Prerequisites: 18-240.

PREREQUISITES: 18213 and 14513 and 15513 and 18240

### **14-684: Cyber Law and Ethics (6 units)**

In this course, students learn about US and international laws they must comply with while working as cyber operations professionals. Learn how to stay on the right side of the law! Starting with international law, we cover the formation of the United Nations, plus the Hague and Geneva Conventions. We study sources of US law including the three branches of government, the Constitution, and relevant case law in privacy. We address statutory laws that apply generally to computer professionals like the Computer Fraud and Abuse act and other Title 18 crimes, as well as laws specific to military applications like Titles 10 and 50. Woven throughout, we consider ethics and social responsibility, then conclude with specific issues around ethical hacking.

PREREQUISITES: None

### **14-691: Special Topics: Multidisciplinary Perspectives and Industry Insights (6 units)**

This seminar-style course offers an in-depth exploration of AI ethics, bringing together industry leaders, policy makers, AI researchers, mindfulness leaders, and startup founders. Designed for engineering students and alums, the course facilitates rich discussions on the ethical implications of AI in various sectors.

PREREQUISITES: None

### **14-699: Silicon Valley Residency (0 units)**

This course is for INI bicoastal students who are fulfilling a semester of residency as part of degree requirements. Residency is defined as being physically present on the SV campus and physically attending class(es) for one full semester (16-month students; Fall 2) or for two full semesters (20-month students; Fall 2 & Spring 2). Courses taken remotely will not fulfill the residency requirement.

PREREQUISITES: None

### **14-707: Information Networking Thesis (6-42 units)**

This course is for INI students who are defending and submitting an academic research-based masters thesis. Enrollment requires special permission, therefore, the INI Academic Affairs Office will enroll those who should be.

PREREQUISITES: None

### **14-728: Independent Study (0-12 units)**

If there is a special topic that interests a student and is relevant to their degree program, the student may negotiate an Independent Study mentored by a Carnegie Mellon faculty member. Through an Independent Study, students can either focus on learning a topic area that is not otherwise available at Carnegie Mellon, or they can assist the faculty advisor and relevant partners in exploring research and/or development opportunities in new areas. The student must provide compelling justification as to (1) why an Independent Study on this topic or project is relevant to their degree program and should be allowed, (2) why the chosen faculty member is an appropriate Independent Study advisor, and (3) the learning objectives and expected deliverables of the Independent Study. Specific proposal requirements and processes are detailed in the INI Student Handbook. This course is open to INI students only, and special permission is required to enroll. Eligible students should contact the INI Academic Affairs Office regarding Independent Study proposal submission.

PREREQUISITES: None

### **14-735: Secure Coding (12 units)**

This course will enable students to understand how software coding defects lead to software vulnerabilities, develop secure software, and manage teams that develop secure software. This course provides a detailed explanation of common programming errors in C and C++ and describes how these errors can lead to code that is vulnerable to exploitation. The course covers secure software development tools and processes while focusing on low-level technical security issues intrinsic to the C and C++ programming languages and associated libraries. The course relies on "learning-by-doing", where students practice hands-on sophisticated secure coding concepts through continuous debugging and creative approaches. Many aspects of the assignments mimic the challenges developers face in a real-world software system. Some assignments will introduce students to a programming language that they might have never seen before such as JavaScript and Rust.

PREREQUISITES: 14513 or 15513 or 18213 or 15213 or 18613

### **14-736: Distributed Systems: Techniques, Infrastructure, and Services (12 units)**

This course explores both foundational and contemporary topics in distributed systems, such as communication, coordinating time, synchronization, consensus, impossibility of agreement, replica management, file systems, distributed SQL and noSQL databases, CAP, ACID, BASE, distributed hashing, anonymous communication, models of computation, and higher-level tools. The course project work focuses on the implementation of scalable, fault-tolerant distributed systems.

PREREQUISITES: 14-513, 15-513, 18-613

### **14-744: Mobile and Embedded Software Design (12 units)**

Designing software for mobile and embedded devices is different from traditional software design. In this course, students will work with embedded devices to: consider hardware constraints in software design; explore the potential value and limitations of sensor data; assess user needs to create useful products or services; and prototype applications using sensors on embedded systems. Unlike a conventional hardware course, this course focuses on the design of application and service software. Low-level details of the processor architecture, embedded operating system, and firmware will not be addressed.

PREREQUISITES: None

### **14-757: Introduction to Machine Learning with Adversaries in Mind**

This course serves as an introduction to machine learning (ML) as well as an introduction to adversarial attacks and defenses. Students will complete programming problems on implementation, attack and defense of spam filters, image classifiers, network anomaly detectors, human activity classifiers, real estate pricing models, search engines, and more. The course will cover the following ML problems and tools: classification, regression, dimensionality reduction,



clustering, expectation-maximization, Markov models and neural networks. Grading will be based on biweekly Python programming assignments.

PREREQUISITES: None

### **14-760: Advanced Real World Data Networks (12 units)**

Students should already have an understanding of networking principles. This course examines how those principles are employed in a variety of real-world scenarios to solve problems that face modern network engineers. This course explores the design, implementation, and application of the network technologies that compose modern and emerging infrastructure and the delivery of the ubiquitous services users expect. Topics may include, for example, 4G and 5G network infrastructures, IPv6, SDN and VFN, data centers, mesh and embedded networks.

PREREQUISITES: 15-641 or 18-441 or 18-741 or 14-740

### **14-761: Applied Information Assurance (12 units)**

This course focuses on practical applications of Information Assurance (IA) policies and technologies in enterprise network environments. The course will include lecture and demonstrations but is designed around a virtual lab environment and scenario that provides for robust and realistic hands-on experiences in dealing with a range of information assurance topic areas. Students will be provided numerous practical opportunities to apply information security practices and technologies to solve real-world IA problems.

PREREQUISITES: None

### **14-798: INI MSIT Project Practicum (24 units)**

Fall: 24 units. This course provides the opportunity to consolidate and apply the skills and knowledge developed in previous coursework in a team-based approach to a real problem. A team of students works with a real-world client on a real-world problem of value to the client. Most important, this is an opportunity to apply the teams advanced engineering and management skills, including the specialized knowledge and skills needed to solve a real problem. In particular, team members must learn to work effectively with clients, quickly understand their problem, negotiate deliverables, and then select, adapt, and apply just the right amount of process and documentation to meet client's needs and effectively manage the project. Prerequisites: Graduate standing and instructor's permission.

PREREQUISITES: None

### **14-811: Special Topics: Applied Adversarial Machine Learning**

Machine learning (ML) algorithms are increasingly embedded in cybersecurity systems, like spam/malware filters and network intrusion detectors, and safety-critical applications, like autonomous vehicles. These ML systems are vulnerable to attack. For example, a spammer may

try to evade a spam filter with a carefully crafted email, or alternatively may try to poison the filter's training data with bogus examples rendering the filter useless. In this course, students will learn how to implement ML algorithms, build practical ML systems, perform evasion and poisoning attacks, and defend against such attacks. The course will cover the following ML problems and tools: classification, dimensionality reduction, clustering, regression, and deep neural networks. Grading will be based on biweekly Python programming assignments with written reports.

PREREQUISITES: Undergraduate Probability and Linear Algebra

### **14-812: Special Topics: Wireless Protocols and Standards for the Internet of Things (6 units)**

This mini introduces non-designers to visual design. Visual design mixes the aesthetic focus in graphic design with the usability requirements of user interface design. In this course, students will exercise their creative side by designing the look & feel for a software application. Students will also learn some design theory so that they can better communicate with design professionals in the future. This course assumes that students have no background in visual design. We will cover topics ranging from color theory to icons and logos. Compared to other courses for non-designers, this course is more focused on the practical nuts and bolts of visual design. Students with prior experience in design or those seeking a course on the end-to-end design process should consider other options.

PREREQUISITES: None

### **14-817: Cyber Risk Modeling**

There are too many cybersecurity risks to manage them all informally. You need a plan! Risk management and threat analysis are structured to craft better organizational security decisions. This course helps you learn how to prioritize risks, secure data assets, and to communicate your security knowledge. This is not a programming class but requires basic statistics (e.g. Monte Carlo analysis, which you will learn or review.) Major topics include: legal compliance, threat modeling, Mitre ATT&CK, the Common Vulnerabilities and Exposures database, and popular risk frameworks (STRIDE, PASTA, NIST, etc.) Those seeking roles where they will work with or become a CSCO, risk officer, or risk analyst will most benefit from this course.

PREREQUISITES: None

### **14-819: Introduction to Software Reverse- Engineering (12 units)**

The course is intended to provide an insight into the art and science of software and firmware reverse-engineering. It covers a variety of topics on how to approach complex problems of analyzing malicious code for the purpose of understanding its internals. By steadily advancing into the science of reverse-engineering, students will observe how a seemingly insurmountable problem of malware binary analysis gradually breaks down into tractable components that can be easily studied, interpreted and documented. The anatomy, behavior and manifestation of

malware will be discussed. Students will receive hands-on experience with techniques analyzing, disassembling, debugging and monitoring malware in a controlled environment.

PREREQUISITES: (18240) and (18213 or 15513)

### **14-821: Special Topics: Fundamentals of Software-Defined Networking (6 units)**

Software Defined Networking (SDN) is an emerging networking technology that has been rapidly changing the networking industry and telecommunications research. Small to big companies such as Nicira, Contrail, Cisco, IBM, Broadcom, Intel, among others have been continuously developing new SDN products. For many scholars in the area, this paradigm shift is changing how traditional networks are envisioned and constructed towards efficient solutions that separate data and control planes. Among the benefits of SDN, we find greater reliability via automation, more efficient network management, cost savings, and faster network scalability. It is true that SDN brings all sorts of benefits. In this light, understanding its foundations and what SDN cannot do is critical. In this course, you will learn the fundamentals of SDN technology and the perspective of different players. This course aims to cover topics such as the history and evolution of SDNs, the motivation for the separation of the control and data plane (including challenges and opportunities of this new paradigm), getting to know SDN controllers (including their tradeoffs and how to customize control-plane behavior), gaining experience with OpenFlow/SDN control, learn about network virtualization (including how it relates to SDN), learn the foundations of programming languages, frameworks, and controllers for SDN (e.g., Pyretic, Kinetic, and Resonance), and study the applications of SDN in multiple areas at different scales.

PREREQUISITES: None

### **14-822: Host Based Forensics (12 units)**

Host Based Forensics provides a systematic introduction to the field of digital forensics. The course aims to familiarize students with the forensic process and to apply forensic principles with many tools of the trade. Upon completion of the course, a student should feel confident in participating in a digital forensic investigation. This course focuses on the forensic process (planning, acquisition, analysis, reporting) as it relates to host system forensics. Class periods will consist of lecture and exercise.

PREREQUISITES: 14-761

### **14-823: Network Forensics (12 units)**

This course introduces concepts and techniques essential for studying network-based evidence applicable to legal investigations. Students will become familiar with a wide range of networking devices, techniques for capturing and analyzing network data, and with the practice of solid forensic methodologies to prepare and protect network based digital evidence. Students will be required to bring their laptops to each class, as they will need to access exercise materials online, use virtual machines in a hypervisor, and answer online quizzes.

PREREQUISITES: 14-761

### **14-828: Browser Security (12 units)**

The Web continues to grow in popularity as platform for retail transactions, financial services, and rapidly evolving forms of communication. It is becoming an increasingly attractive target for attackers who wish to compromise users' systems or steal data from other sites. Browser vendors must stay ahead of these attacks by providing features that support secure web applications. This course will study vulnerabilities in existing web browsers and the applications they render, as well as new technologies that enable web applications that were never before possible. The material will be largely based on current research problems, and students will be expected to criticize and improve existing defenses. Topics of study include (but are not limited to) browser encryption, JavaScript security, plug-in security, sandboxing, web mashups, and authentication. The course will involve an intensive group research project focusing on protocols/algorithms, vulnerabilities, and attacks as well as several individual homework and programming tasks. Groups will perform a sequence of cumulative tasks (literature review, analysis, simulation, design, implementation) to address aspects of their chosen topic, occasionally reporting their results to the class through brief presentations, leading to a final report.

PREREQUISITES: None

### **14-829: Mobile and IoT Security (12 units)**

For many people, mobile and embedded devices have become an essential part of life and work. As such devices represent many and varied combinations of technologies, they have unique security and privacy issues that potentially impact users, developers, service providers, manufacturers, and regulators. This course will focus on various aspects of security and privacy that are faced by mobile and Internet of Things devices, including aspects of wireless communication and networking, mobile computing, data analytics, security, and privacy. The course will include studies of security and privacy aspects of networking (including telecom, enterprise, personal, etc.), applications, and data analytics as relevant to mobile and embedded/IoT devices. One of the main goals of the course is to improve knowledge and awareness of security issues faced by mobile application developers, embedded system builders, and smart system designers. Material will cover standards, best practices, and research challenges in both deployed and emerging systems. Topics of study include (but are not limited to) telecom protocols and vulnerabilities; mobile/IoT network security; security and privacy in edge computing; mobile application security; and location and activity privacy. In addition to individual homework assignments, students will participate in an intensive group project involving significant research, development, and experimentation. Graduate standing is required to register for this course.

PREREQUISITES:

(18631 or 18730 or 14741) and (14740 or 18756 or 15641)

### **14-832: Cyber Forensics Capstone (12 units)**

The CyFIR concentration capstone course challenges students by placing them in the middle of a realistic hands-on investigation taking place immediately after a crime. Over the course of the semester students will work together in groups to take the case through every phase of an

investigation, from active incident response to post mortem investigation, and even to prosecution. Students will do their best to represent their client's interests, both by finding evidence to exonerate their client, as well as to implicate the guilty parties. Instructors will teach students to utilize advanced event correlation and reconstruction techniques as well as emerging data collection and analysis approaches to best convey their findings to different types of target audiences. Using both host-based and network-based forensics techniques, students will learn to effectively synthesize data, utilize problem solving skills to draw investigative conclusions, and document their analysis. Additionally, students will be required to follow sound forensic methodologies to protect and prepare digital evidence throughout their mock investigations. Furthermore, students will learn to effectively summarize and communicate their forensic analysis through technical report writing and communication best practices. Upon completion of this course, students will be prepared to participate in and guide enterprise cyber security, security incident response, and forensic operations for large organization.

PREREQUISITES: 14-761 and 14-822 and 14-823

### **14-848: Cloud Infrastructure: Design, Analysis and Implementation (12 units)**

Cloud computing focuses on delivery of services via on-demand and fluidly scalable shared resources. This course focuses on design and implementation of networked systems and software necessary to implement the infrastructure for elastic, global-scale computing and storage clouds. Upon successful completion of the course, students will be able to design, implement, and analyze the infrastructure underlying cloud- and edge-based services. Topics covered in this course include data center networking, cloud-scale storage, caching, large-scale distributed computing, edge computing, resource utilization and sharing, and cloud service frameworks. The course material will focus on recent and landmark research papers and existing tools and software systems. Students will have substantial programming project work in which they design, implement, and analyze aspects of cloud infrastructure and services. Students are expected to be proficient in object-oriented programming and Linux system programming and command-line tools.

PREREQUISITES: None

Due to the interdisciplinary nature of our programs, INI students can take classes from various departments across CMU's campus while in SV. The list of these courses including descriptions is available on each individual department's website:

- Electrical & Computer Engineering (ECE): <https://courses.ece.cmu.edu/>
- School of Computer Science (SCS): <http://www.cs.cmu.edu/course-listings-department>
- H. John Heinz III College of Information Systems and Public Policy (Heinz): [https://api.heinz.cmu.edu/courses\\_api/course\\_list/](https://api.heinz.cmu.edu/courses_api/course_list/)
- Integrated Innovation Institute (III): <https://www.cmu.edu/iii/degrees/mssm/curriculum.html>

# Faculty

Due to the interdisciplinary nature of our programs, INI students can take classes and work with faculty members from various departments across CMU's campus while in SV. Faculty directories for each of these departments are available at:

- ECE: <http://www.ece.cmu.edu/directory/index.html>
- SCS: <http://www.cs.cmu.edu/directory>
- Heinz: <http://www.heinz.cmu.edu/faculty-and-research/faculty-profiles/index.aspx>
- III: <https://www.cmu.edu/iii/innovators/faculty-staff/index.html>

Below is the list of INI faculty members and their qualifications:

## **Dena Haritos Tsamitis**

Barbara Lazarus Professor in Information Networking

Ph.D. of Education, Higher Education Management, University of Pennsylvania  
B.S., Information Science, University of Pittsburgh

## **Pedro Bustamante**

Assistant Teaching Professor, INI

Ph.D. in Information Sciences with concentration in Telecommunications, 2021, University of Pittsburgh  
M.S. in Telecommunications, 2016, University of Pittsburgh  
B.A. in Electronics Engineering, 2010, Universidad del Azuay

## **Mohamed Farag**

Assistant Teaching Professor, INI

Doctor of Engineering, Engineering Management, 2019, George Washington University  
M.S. in Computer Science, 2014, Maharishi International University  
B.S. in Information Technology, 2011, Minoufiya University

## **Hanan Hibshi**

Assistant Teaching Professor, INI

Ph.D. in Societal Computing, 2018, Carnegie Mellon University  
M.S. in Information Security Technology and Management, 2011, Carnegie Mellon University  
B.S. in Computer Science, 2003, King Abdul-Aziz University

## **Quinn Jacobson**

Professor of the Practice, INI

Ph.D. Electrical and Computer Engineering, 1999, University of Wisconsin – Madison  
B.S. Computer Engineering, 1994, University of California – Santa Cruz

**Cynthia Kuo**

Associate Professor of the Practice, INI

Ph.D. Engineering & Public Policy, 2008, Carnegie Mellon University

M.S. Engineering & Public Policy, 2006, Carnegie Mellon University

B.S. Symbolic Systems, 2000, Stanford University

**Joanne Peca**

Associate Professor of the Practice, INI

Associate Director, INI

Ed.D. in Organizational Leadership, Northeastern University

M.S. in Information Systems, Drexel University

MBA Rider University

B.A. in Liberal Studies, Rider University

**Patrick Tague**

Associate Teaching Professor, INI

Ph.D., Electrical Engineering, 2009, University of Washington

B.S. degrees in Mathematics and Computer Engineering, 2003, University of Minnesota

**David Varodayan**

Associate Teaching Professor, INI

Ph.D. Electrical Engineering, 2010, Stanford University

M.S. Electrical Engineering, 2005, Stanford University

B.A.Sc. Engineering Science, 2003, University of Toronto

*For more information on the INI faculty please refer to the INI website at INI:*

<https://www.cmu.edu/ini/about/team/>

The INI also has a number of adjunct instructors who are leading experts in their fields:

**David Belasco**

Adjunct Instructor, INI, Carnegie Mellon University

Threat Analyst, Threat and Vulnerability Analysis, Software Engineering Institute, Carnegie Mellon University

B.S. in Computer Engineering, 2006, Pennsylvania State University

**Lake Dai**

Adjunct Instructor, INI, Carnegie Mellon University

B.S. in Economics, Beijing International Studies University

M.S. in Business Administration, University of Southern California

**Jeffrey Gennari**

Adjunct Instructor, INI, Carnegie Mellon University  
Senior Member Technical Staff, CERT, Software Engineering Institute, Carnegie Mellon University

M.S. in Software Engineering, 2012, Carnegie Mellon University  
M.S. in Information Science, 2004, University of Pittsburgh  
B.S. in Information Science, University of Pittsburgh.

**Christopher Herr**

Adjunct Instructor, INI, Carnegie Mellon University  
Senior Cyber Security Exercise Developer & Trainer, CERT, Software Engineering Institute, Carnegie Mellon University

M.S. Information Science and Security, 2010, University of Pittsburgh  
M.S. Criminal Justice, 2008, University of Cincinnati  
B.S./B.A. Economics, Physics and Astronomy, 2004, University of Pittsburgh

**Matt Kaar**

Adjunct Instructor, INI, Carnegie Mellon University  
Cyber Security Exercise Developer & Trainer, CERT, Software Engineering Institute, Carnegie Mellon University

M.S. Information Security Technology and Management, 2006, Carnegie Mellon University  
B.S. Computer Science, 2002, Georgia Institute of Technology

**Nektarios Leontiadis**

Adjunct Instructor, INI, Carnegie Mellon University

Ph.D. Engineering & Public Policy, 2014  
M.S. Information Systems, 2006, Athens University of Economics and Business  
B.S. in Computer Science, 2005, Athens University of Economics and Business

**Catherine Liao**

Adjunct Instructor, INI, Carnegie Mellon University

M.S. in Health Economics, Outcomes and Management in Cardiovascular Sciences, 2021, The London School of Economics and Political Science  
M.B.A., 2012, Imperial College London  
B.S. in Management Information Systems, 2005, Excelsior University

**William Nichols**

Adjunct Instructor, INI, Carnegie Mellon University  
Infrastructure Engineer, Software Engineering Institute, Carnegie Mellon University



Ph.D. in Physics, Carnegie Mellon University

**Christopher Rodman**

Adjunct Instructor, INI, Carnegie Mellon University

Senior Cybersecurity Operations Researcher, CERT, Software Engineering Institute, Carnegie Mellon University

M.S. Computer and Information Systems Security/Information Assurance, 2016, Robert Morris University

B.S. Information Science and Technology, 2005, Penn State University

**Gabriel Somlo**

Adjunct Instructor, INI, Carnegie Mellon University

Cyber Security Engineer - Exercise Developer, CERT, Software Engineering Institute, Carnegie Mellon University

Ph.D. Computer Science, 2005, Colorado State University

M.S. in Computer Science, 1997, Colorado State University

B.S. in Computer Science, 1995, Tech. Univ. of Timisoara, Romania

**Adam Welle**

Adjunct Instructor, INI, Carnegie Mellon University

Senior Cyber Security Engineer, Software Engineering Institute, Carnegie Mellon University

M.S. in Computer Science, Johns Hopkins University

M.S. in Information Assurance, Johns Hopkins University

B.S. in Computer Science, Hawaii Pacific University

# CMU University Policies

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this catalog, the following resources are available to assist you in understanding community expectations:

- The Word/Student Handbook: [www.cmu.edu/student-affairs/theword//index.html](http://www.cmu.edu/student-affairs/theword//index.html)
- Academic Integrity Website: [www.cmu.edu/academic-integrity](http://www.cmu.edu/academic-integrity)
- Graduate Education Website: <http://www.cmu.edu/graduate/policies/index.html>

The complete index of CMU university policies is available at: <https://www.cmu.edu/policies/>.

Some of the university policies most relevant to the INI students are also highlighted in this section.

## Carnegie Mellon Code

Students at Carnegie Mellon, because they are members of an academic community dedicated to the achievement of excellence, are expected to meet the highest standards of personal, ethical and moral conduct possible.

These standards require personal integrity, a commitment to honesty without compromise, as well as truth without equivocation and a willingness to place the good of the community above the good of the self. Obligations once undertaken must be met, commitments kept.

As members of the Carnegie Mellon community, individuals are expected to uphold the standards of the community in addition to holding others accountable for said standards. It is rare that the life of a student in an academic community can be so private that it will not affect the community as a whole or that the above standards do not apply.

The discovery, advancement and communication of knowledge are not possible without a commitment to these standards. Creativity cannot exist without acknowledgment of the creativity of others. New knowledge cannot be developed without credit for prior knowledge. Without the ability to trust that these principles will be observed, an academic community cannot exist.

The commitment of its faculty, staff and students to these standards contributes to the high respect in which the Carnegie Mellon degree is held. Students must not destroy that respect by their failure to meet these standards. Students who cannot meet them should voluntarily withdraw from the university.

The Carnegie Mellon Code is also available online at: <https://www.cmu.edu/student-affairs/theword/code/index.html>.

## **CMU Statement of Assurance**

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, disability, age, sexual orientation, gender identity, pregnancy or related condition, family status, marital status, parental status, religion, ancestry, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

The university's [Discriminatory and Sexual Misconduct Policy](#) contains grievance procedures that provide for the prompt and equitable resolution of Complaints alleging any action which would be prohibited by this Policy.

Inquiries concerning the application of and compliance with this statement should be directed to the Office for Institutional Equity and Title IX, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-7125.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.

The Statement of Assurance is also available online at: <https://www.cmu.edu/student-affairs/theword/statement/index.html>.

## **CMU Consumer Information**

Please refer to Appendix A for the CMU Consumer Information.

# Admissions & Enrollment Policies

## Deferral Policy

The INI's deferral policy is determined on a case-by-case basis. We typically do not allow admission deferrals. Each year, applicants are reviewed and ranked with the current applicant pool. Students are accepted for admission into the program for a particular academic year and may not defer admission or enrollment.

**Applicant's Responsibility:** Follow the Application Instructions: In order to successfully complete your application, please follow the instructions and adhere to the deadlines. All requested/required application documents including unofficial transcripts, ESL test scores, recommendations, essay/area of interest questions, etc., must be submitted online. An application may be "Incomplete" if the required documents are not provided by the posted deadlines or in the manner requested in the instructions.

**Check Your Application Status:** Applicants have access to their Status Page through the admissions and enrollment period and may check the status of their application online at any time. Applicants will receive emails when updates are posted by INI staff and faculty. Application status updates cannot be provided by request.

The application submission package (<https://www.cmu.edu/ini/admissions/howtoapply.html>) must include the material listed below.

To be considered for admission, you must submit the following documents:

- A completed Online Application Form (<https://engineering.cmu.edu/education/graduate-programs/apply.html>)
- Unofficial Transcripts from all post-secondary/higher education institutions attended. If admitted and enrolled, students will receive a formal request and instructions for submitting official academic records. (see <https://www.cmu.edu/ini/admissions/howtoapply.html> for more details).
  - Please note: Admitted applicants who accept enrollment must be prepared to show Proof of Graduation from their undergraduate program. Proof includes final official undergraduate transcripts and degree certificate(s) and/or diploma(s) along with all other official academic records from any other post-secondary programs attended, submitted no later than the stated deadline in the manner requested by the INI. Proof of graduation is a condition of enrollment. Submission of an application serves as an agreement to meet this requirement as stated. Failure to submit proof of graduation can result in termination of enrollment.
- Three letters of recommendation (online only): The letters should be from faculty and/or recent employers who know you well and can speak to your technical abilities and quality of work. Letters may be submitted by your recommender(s) following the submission of your online application.

- **Proof of English Language Proficiency:** All international and United States permanent resident applicants must take an English language proficiency exam. An English language proficiency test is not required if the applicant is a CMU student or alum. It is also not required for applicants with United Kingdom or Canadian citizenship. Students may submit one of the following: TOEFL (including At Home and Best Score tests), IELTS or Duolingo English Test that is current and can be reported officially through the testing website. Expired reports are not accepted.
- **Skills & Competencies, Short Essay, Video Essay questions.**  
Resume: No more than two pages.

## **International Students**

The INI admits students from other countries. All foreign students must obtain an I-20 certificate or DS-2019 certificate of eligibility in order to qualify for an F-1 or J-1 status to attend CMU. Required documents are processed through the Office of International Education (OIE) which acts as the certificate of eligibility sponsor of foreign students entering CMU. Incoming students are instructed to pay for delivery of their I-20 certificate or DS-2019 certificate if applicable.

All international and United States permanent resident applicants must take an English language proficiency exam. An English language proficiency test is not required if the applicant is a CMU student or alum. It is also not required for applicants with United Kingdom or Canadian citizenship. English language proficiency may be demonstrated in one of the following ways:

1. Results from the internet-based Test of English as a Foreign Language (TOEFL – including At Home and Best Score tests), minimum acceptable score is 98;
2. Results from the International English Language Testing System (IELTS), minimum acceptable score is 7;
3. Results from a Duolingo English Test (select "CMU – College of Engineering"), minimum acceptable score is 105;

For students have not met our minimum scores as listed above, the INI submits to OIE a Verification of English Language Proficiency for Graduate Admissions form, signed by the INI Director and the Dean of the College of Engineering (CIT).

Failure to submit an approved English Proficiency test may result in the application being marked “Incomplete” and not reviewed for admission consideration.

Once admitted into INI, non-native English speakers may use the Communications and Language Services Office for additional language support at no cost: <https://sv.cmu.edu/student-services/communication-language-services.html>.

## **Domestic Student Qualification**

Admission to Carnegie Mellon University graduate programs requires demonstration of successful completion of an undergraduate degree program as specified by the graduate department. Successful completion must be demonstrated by submission of

official academic records issued by the degree-granting institution during the matriculation process, in the manner requested by the department.

## **Language of Instruction**

All instruction occurs in English.

## **Confidentiality of Communications**

All information provided to students as a result of their application including subsequent correspondence is considered confidential and should not be communicated to other applicants. Please note that applicants are expected to comply with the confidentiality requirement as a condition of admission.

## **Transfer of Credit Policy**

Up to 24 units of courses taken at another university, whether taken before or after entering the INI graduate program, may be transferred and count as electives, providing:

1. They fulfill an INI graduate program requirement;
2. They are graduate-level courses at the university where they were taken; and
3. They have not been used to fulfill requirements for any previously earned degree.

A grade of 'B' or better must be earned for the courses transferred. All transfer credits must be approved by the INI and the CIT Dean's Office, and the INI will determine how the transferred credits will be reflected in the student's degree requirements. The transfer credits will appear on the student's transcript as an INI elective and are not factored into the core or cumulative GPAs.

Transfer credit is not granted prior to admission to the graduate program and must be approved by the INI and the CIT Dean's Office after the student has satisfactorily completed at least 36 units of graduate courses at Carnegie Mellon. After matriculating to Carnegie Mellon, INI students should consult with their academic advisor before taking a course at another university.

Students should submit an INI petition, along with an official transcript and the course syllabus from the semester in which the course was completed to the INI AAO. Information regarding petitions can be found on our website. Students may be required to show proof that the course(s) they want to transfer were not used to fulfill requirements for any previously earned degree. In addition, the student must complete the Graduate Transfer Credit Request Form, located with the CIT graduate student policies at: <https://engineering.cmu.edu/education/academic-policies/undergraduate-policies/transfer-credit.html>. The INI, not the student, will forward the appropriate information to the Dean's Office for approval.

The university's policy on Transfer Credit Evaluation and Assignment is available at the following link: <http://www.cmu.edu/policies/>

INI has not entered into an articulation or transfer agreement with any other college or university for that provides for the transfer of credits in the bicoastal MSIT-IS, MSIT-IS- Applied, MSIT-IS Advanced, MSIT-IS Applied Advanced, MSMITE, MSMITE- Applied, MSMITE-Advanced and MSMITE-Applied Advanced programs.

The INI does not award credit for prior experiential learning to students enrolled in the bicoastal MSIT-IS, MSIT-IS- Applied, MSIT-IS Advanced, MSIT-IS Applied Advanced, MSMITE, MSMITE- Applied, MSMITE-Advanced and MSMITE-Applied Advanced programs.

## **Cancellation, Withdrawal, Leave of Absence, and Refund Policies**

### **Student's right to cancel (withdrawal/leave of absence)**

A student has the right to cancel the student's Enrollment Agreement by either taking a leave of absence from the Program (leaving Carnegie Mellon University temporarily with the firm and stated intention of returning) or by withdrawing from the Program (leaving Carnegie Mellon University with no intention of returning). If the student withdraws or take a leave of absence from Carnegie Mellon University, the student may be eligible for a tuition adjustment or a refund of certain fees (excluding any Application Fee, Registration Fee and Enrollment Deposit).

To cancel the student's Enrollment Agreement and take a leave of absence or withdraw, the student must complete Carnegie Mellon University's Leave of Absence or Withdrawal form, as applicable, and return it to Carnegie Mellon University's Registrar's Office, at 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213. The Leave of Absence and Withdrawal forms, and additional information about leaves of absence and withdrawal, can be found on Carnegie Mellon University's website at <https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/>.

For students who notify the university of their intent to take a leave of absence or withdraw, the official date is the earliest of the:

- The date the student began the withdrawal or leave of absence process;
- The date the student notified his or her home department;
- The date the student notified the associate dean of his or her college: or
- The date the student notified the dean of students.

For students who do not notify the university of their intent to take a leave of absence or withdraw, the official date is:

- The midpoint of the semester;
- The last date the student attended an academic-related activity such as an exam, tutorial or study group, or the last day the student turned in a class assignment.

## **Refund Policy**

### **Refunds in General**

Students who withdraw from the Program or take a leave of absence after having paid the current semester's tuition and fees or receiving financial aid are subject to the following refund and repayment policies. No other charges are refundable.

### **Exit Counseling**

All borrowers of Federal student loans must complete a Federally mandated exit counseling session when graduating or dropping to less than half-time enrollment status, including by withdrawing or taking a leave of absence. Exit counseling prepares students for repayment. Students must complete an exit counseling session in its entirety, with complete and correct information; otherwise, the student's degree, diploma and official transcripts may be withheld. Information about exit counseling sessions can be found on Carnegie Mellon University's website at <https://www.cmu.edu/sfs/financial-aid/exit-counseling.html>.

### **Withdrawals/Leaves on or before 10th Class Day (during the Cancellation Period)**

Students who withdraw or take a leave of absence on or before the 10th class day of the relevant semester will receive a refund of 100% of tuition and fees (excluding any Application Fee or Registration Fee and Enrollment Deposit).

### **Withdrawals/Leaves after 10th Class Day (after the Cancellation Period)**

Students who withdraw or take a leave of absence after the 10th class day of the relevant semester but before completing 60% of the semester will be assessed tuition based on the number of days completed within the semester. This includes calendar days, class and non-class days, from the first day of classes to the last day of final exams. Breaks which last five days or longer, including the preceding and subsequent weekends, are not counted. Thanksgiving and Spring Break are not counted. STRF will be adjusted accordingly with any adjustment of tuition. There is no tuition adjustment after 60% of the semester is completed. There is no refund of University fees after the 10th class day of the relevant semester.

### **Tuition Adjustment Appeals**

Students may appeal to have tuition adjustments for their leave of absence or withdrawal if they feel that they have extenuating circumstances. These appeals will be reviewed in the context of Carnegie Mellon University's tuition adjustment policy, as stated above. These appeals must be made in writing to Carnegie Mellon University's Registrar using Carnegie Mellon University's Tuition Appeal Adjustment form. Information about Carnegie Mellon University's tuition adjustment policy and tuition adjustment appeals can be found on Carnegie Mellon University's website at <https://www.cmu.edu/sfs/tuition/adjustment>.



## **Repayment to Lenders/Third Parties**

If any portion of refundable tuition and/or fees was paid from the proceeds of a loan or third party, the refund may be sent to the lender, third party or, if appropriate, to the Federal or state agency that guaranteed or reinsured the loan, as required by law and/or Carnegie Mellon University policy. Any amount of the refund in excess of the unpaid balance of the loan shall be first used to repay any student financial aid programs from which the student received benefits, in proportion to the amount of the benefits received, and any remaining amount shall be paid to the student.

**Responsibility for Loan:** If the student obtains a loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If the student has received Federal student financial aid funds, the student is entitled to a refund of moneys not paid from Federal student financial aid program funds. If the student is eligible for a loan guaranteed by the Federal or state government and the student defaults on the loan, both of the following may occur: 1) The Federal or state government or a loan guarantee agency may take action against the student, including applying any income tax refund to which the person is entitled to reduce the balance owed on the loan. 2) The student may not be eligible for any other Federal student financial aid at another institution or other government assistance until the loan is repaid.

## **Academic Standards**

### **Grades**

Below are the policies surrounding grades for students in the INI.

### **University Policy on Grades**

The university policy on grading offers details concerning university grading principles for students taking courses and covers the specifics of assigning and changing grades, grading options, drop/withdrawals and course repeats. It also defines the undergraduate and graduate grading standards.

The CMU Grading Policy is available at: <https://www.cmu.edu/policies/student-and-student-life/grading.html>.

### **CIT Grading Policy**

INI 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. Grades lower than 'C', meaning C- or below, are considered failure in CIT and will not count toward degree requirements.

The CIT Registration, Grading and Credit Policies are available at: <https://engineering.cmu.edu/education/academic-policies/graduate-policies/registration-grading-credit.html>.

### **Incomplete Grade**

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

The CMU Grading Policy is available at: <https://www.cmu.edu/policies/student-and-student-life/grading.html>.

### **Withdrawal Grade/Withdrawing from Courses**

Students can withdraw from a course after the add/drop deadline. Students should adhere to the withdrawal deadlines outlined in the Official CMU Academic Calendar available at: <https://www.cmu.edu/hub/calendar/index.html>. This will result in a 'W' on the transcript, which is not factored into the grade point average (GPA). To withdraw, the course withdrawal request form must be completed and submitted to the academic advisor for approval. If approved, the academic advisor will send the form to the HUB for processing.

### **Grade Point Average**

In order to graduate, each student must have a GPA of at least 3.0 in both core GPA and cumulative GPA.

### **Academic Standing**

Good academic standing is defined by having a core GPA and cumulative GPA of at least 3.0 or above. A student will receive a warning letter for a GPA lower than 3.0 in the most recently completed semester but will remain in good academic standing if core and cumulative GPAs meet the minimum requirement. If a student is not in good academic standing, it is their responsibility to consult with their academic advisor in a timely manner.

A student can be in good academic standing and on probation at the same time due to incidents unrelated to their academic performance.

### **Probation and Dismissal Policies**

#### **Academic Probation**

Students who do not meet minimum performance criteria may be placed on academic probation. The purpose of academic probation is to provide the additional support and assistance necessary for adequate progress towards degree requirements. For more details about the College of Engineering's academic standards policy, please visit: <http://coursecatalog.web.cmu.edu/schools-colleges/collegeofengineering/#academicstandardstextcontainer>.

Throughout the semester, the INI reviews each student's academic performance and progress, including at tenth day of classes, mid-semester and end of semester. If a student is not enrolled in 36 units towards degree requirements each semester (excluding summer), the INI may place that student on academic probation until their performance in the program adheres with our stated course load policy.

Additionally, at the end of each semester, the INI Academic and Student Services completes a review of each student's performance. GPA for academic review is computed based on the guidelines for graduation requirements. If a student has a core and/or cumulative GPA of less than 3.0, the student is immediately placed on academic probation.

Students who are notified that they are on academic probation are solely responsible for setting up a meeting with their academic advisor within 14 days. During the meeting, the student and their advisor must sign the letter and return it to the INI Director's Office within that timeframe.

Students on academic probation may be subject to the following penalties:

- May have any existing INI scholarships and/or financial awards awarded by the INI rescinded
- Cannot be selected to receive awards, fellowships or scholarships
- May not formally represent INI as an officer or other position in a student club or campus organization

A student on academic probation will be removed from probation during the next end-of-semester academic review if their core and cumulative GPAs are 3.0 or higher at that time. The student's scholarship or financial award will be reinstated for future semesters if they are removed from probation; however, the amount that was rescinded will not be reapplied to the student's account.

A student may be permanently dropped from the INI if their core or cumulative GPA remains lower than 3.0 at the end of two consecutive full semesters. They will have an opportunity to appeal if this occurs. The first appeal must go to the Dean of the College of Engineering's office. A detailed summary of the graduate student appeals process can be found here: <http://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>.

Courses that negatively affect the core GPA cannot be moved from the core requirement unless another completed course can replace the course with the lower grade.

## **Academic Integrity**

Students at Carnegie Mellon are engaged in intellectual activity consistent with the highest standards of the academy. The relationship between students and instructors and their shared commitment to overarching standards of respect, honor and transparency determine the integrity of our community of scholars. The actions of our students, faculty and staff are a representation of our university community and of the professional and personal communities that we lead. Therefore, a deep and abiding commitment to academic integrity is fundamental to a Carnegie Mellon education. Honesty and good faith, clarity in the communication of core values,

professional conduct of work, mutual trust and respect, and fairness and exemplary behavior represent the expectations for ethical behavior for all members of the Carnegie Mellon community.

The INI adheres to Carnegie Mellon University's policy on academic integrity. Please review the University Policy on Academic Integrity: <https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>. The policy includes the University expectations around academic integrity and provides definitions of cheating, plagiarism, and unauthorized assistance.

A review of the University's Academic Disciplinary Actions procedures (<https://www.cmu.edu/student-affairs/theword/academic-integrity-actions/index.html>) is also recommended. These procedures outline the process for investigating, reporting, and adjudicating violations of the University Policy on Academic Integrity. The procedures also outline the appeal process.

### **Academic Integrity Violations**

When the INI is notified that a student has committed a violation of the CMU Policy on Academic Integrity, the INI will follow the CMU Academic Integrity Actions Procedures.

Details related to the academic integrity policy and actions procedures can be found here: <https://www.cmu.edu/student-affairs/theword/academic-integrity-actions/index.html>.

Additionally, all scholarships and financial awards provided by the INI upon admission are subject to eligibility requirements. Students must remain in good academic standing and adhere to Carnegie Mellon University's policy on Academic Integrity.

If a student violates the CMU policy, they are no longer eligible for INI scholarships and/or financial awards. No additional scholarship will be posted to their student account for the remainder of the program. If the violation occurs in the final semester, the financial award posted for that semester will be rescinded.

The INI may recommend additional sanctions beyond course-level action.

### **Attendance policies**

Students must be physically present and attend class at the start of the semester. If extenuating circumstances exist that prevent a student from arriving to campus at the start of the semester, the student must notify their academic advisor immediately. Not attending class from the start of the semester will have a detrimental effect on a student's progress in the program. The INI 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.

## **Suspension/Required Withdrawal Policy**

University suspension is a forced, temporary leave from the university. A student may be suspended for academic, disciplinary and administrative reasons. The INI adheres to Carnegie Mellon's policy on student suspension/required withdrawal policy. The complete policy is available at the following link: <https://www.cmu.edu/policies/student-and-student-life/suspension-required-withdrawal-policy.html>.

## **Student Rights and Grievance Procedures**

The INI adheres to Carnegie Mellon's Students' Rights policy. The complete policy can be found at the following link: <https://www.cmu.edu/policies/student-and-student-life/students-rights.html>.

The INI adheres to Carnegie Mellon's Graduate Student Appeal and Grievance procedures. The summary of these procedures can be found at the following link: <https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>.

## **Student Record Retention Policy**

The INI adheres to the CMU Student Record Retention Policy.

## **Student Record Retention Policy**

The policy of Carnegie Mellon University is to ensure the safety, accessibility, confidentiality, and good condition of the permanent record of every Carnegie Mellon student, past and present.

Carnegie Mellon University (CMU), established in 1900, holds all permanent records of our students (current and former) in the University Registrar's Office. We maintain original paper records in an offsite secure climate-controlled underground storage facility along with a microfilmed copy of each record. In addition, a copy of microfilmed records also resides in the University Registrar's Office in Pittsburgh, PA. This includes all students globally, include those students studying at our California teaching location and instructional sites. CMU has established the University Registrar's Office as the official data steward of all student records.

## **Historical Records 1906-1989**

For every student enrolled at Carnegie Mellon University as a new or continuing student prior to the fall semester, 1989, and dating back to 1906, the University Registrar's Office of Carnegie Mellon University maintains a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not within the student's official transcript. The official transcript provides brief personal information to identify the student as unique. It contains courses, units and grades; semester and cumulative grade point averages; all degrees earned; transfer credit or advanced placement and dean's list indications.

The University Registrar's Office has established and maintains within a microfiche copy of good, readable, and reproducible quality of the student's permanent record in a secured records

unit. A secondary permanent microfilm copy of all records will be maintained in good condition in the climate-controlled, fire-proof, limited-access security at an offsite facility.

### **Modern Records 1989-Current**

For every student enrolling at Carnegie Mellon University as a new or continuing student beginning in fall semester, 1989, the University Registrar's Office of Carnegie Mellon University will establish and maintain within an electronic data file in the University Student Services Suite (S3, our student information system) a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not. The University Registrar's Office staff will, under the direction of the University Registrar, add to the electronic record such new information as pertains to the student's demographic and academic record as it becomes available, semester-by-semester, and as the student progresses in his/her career at Carnegie Mellon University.

Daily, the Carnegie Mellon University Computing Services Division will perform a backup of all databases that have been altered during that day. Weekly, the Computing Services Division will perform a complete backup of all records within the student data file. The Computing Services Division staff will store the daily backups in the climate-controlled, fire-proof, limited-access security facility in the Computer Operations center in Cyert Hall on the Carnegie Mellon University campus. Upon successful completion of the monthly backup, the Computing Services Division staff will securely transfer the weekly and monthly backups from the preceding month to climate-controlled, fire-proof, secured vault at an offsite facility.

### **Cessation of Operations**

In the unlikely event that CMU (which has existed for more than 100 years) ceases to exist, it will make appropriate arrangements to comply with clauses (1) and (2) for all its students consistent with the Commonwealth of Pennsylvania statutes and law. I have an informal plan and agreement with the University of Pittsburgh's University Registrar's Office, that should either school cease, we would exchange student records.

The complete policy is available at <https://www.cmu.edu/es/docs/record-retention-policy.pdf>.

## Financial Information

### Fees and Charges for INI Pittsburgh - Silicon Valley MSIT – IS and MSMITE programs 2024-2025 (while on SV Campus)

**Standard Study Option for students who matriculated in Fall 2023 and Spring 2024.  
Applied Study Option for students who matriculated in Fall 2023 and Spring 2024.**

	Entire Program (SV Campus)	First Semester	
Program Tuition*	\$28,718	\$28,718	Prorated upon withdrawal/leave of absence. See Refund Policy provisions of the Enrollment Agreement. The amount quoted covers only the estimated tuition for the portion of the program provided in California.
Required University Fees	\$488	\$488	Non-Refundable after the 10th class day of the relevant semester. See Refund Policy provisions of the Enrollment Agreement.
Books and Supplies (estimated)	\$1,106	\$1,106	Estimated cost for current period of attendance. Used, digital and rented books and other factors may reduce/increase actual cost.
Student Tuition Recovery Fund (STRF)	\$0	\$0	Non-Refundable (\$0 for every \$1,000 of net tuition rounded to the nearest \$1,000). See information below about the STRF.
ESTIMATED TOTAL FEES/CHARGES FOR THE ENTIRE PROGRAM			\$30,312
ESTIMATED TOTAL FEES/CHARGES FOR FIRST SEMESTER			\$30,312
FEES/CHARGES DUE UPON ENROLLMENT			\$0

**Fees and Charges for INI Pittsburgh - Silicon Valley MSIT – IS and MSMITE programs 2024-2025 (while on SV Campus)**

**Advanced Study Option for students who matriculated in Fall 2023.**

**Applied Advanced Study Option for students who matriculated in Fall 2023.**

	Entire Program (SV Campus)	First Semester	
Program Tuition*	\$57,436	\$28,718	Prorated upon withdrawal/leave of absence. See Refund Policy provisions of this Enrollment Agreement. The amount quoted covers only the estimated tuition for the portion of the program provided in California.
Required University Fees	\$976	\$488	Non-Refundable after the 10th class day of the relevant semester. See Refund Policy provisions.
Books and Supplies (estimated)	\$2,212	\$1,106	Estimated cost for entire program. Used, digital and rented books and other factors may reduce/increase actual cost. The amount quoted covers only the estimated cost for the portion of the program provided in California.
Student Tuition Recovery Fund (STRF)	\$0	\$0	Non-Refundable (\$2.50 for every \$1,000 of net tuition rounded to the nearest \$1,000). See information below about the STRF.
ESTIMATED TOTAL FEES/CHARGES FOR THE ENTIRE PROGRAM			\$60,624
ESTIMATED TOTAL FEES/CHARGES FOR FIRST SEMESTER			\$30,312
FEES/CHARGES DUE UPON ENROLLMENT			\$0



**Fees and Charges for INI Pittsburgh - Silicon Valley MSIT – IS and MSMITE programs 2024-2025 (while on SV Campus)**

**Advanced Study Option for students who matriculated in Spring 2024.**

**Applied Advanced Study Option for students who matriculated in Spring 2024.**

	Entire Program (SV Campus)	First Semester	
Program Tuition	\$58,872	\$28,718	Prorated upon withdrawal/leave of absence. See Refund Policy provisions of the Enrollment Agreement. The amount quoted covers only the estimated tuition for the portion of the program provided in California.
Required University Fees	\$1,000	\$488	Non-Refundable after the 10th class day of the relevant semester. See Refund Policy provisions.
Books and Supplies (estimated)	\$2,267	\$1,106	Estimated cost for entire program. Used, digital and rented books and other factors may reduce/increase actual cost. The amount quoted covers only the estimated cost for the portion of the program provided in California.
Student Tuition Recovery Fund (STRF)	\$0	\$0	Non-Refundable (\$2.50 for every \$1,000 of net tuition rounded to the nearest \$1,000). See information below about the STRF.
ESTIMATED TOTAL FEES/CHARGES FOR THE ENTIRE PROGRAM		\$62,140	
ESTIMATED TOTAL FEES/CHARGES FOR FIRST SEMESTER		\$30,312	
FEES/CHARGES DUE UPON ENROLLMENT		\$0	

**Fees and Charges for INI Pittsburgh - Silicon Valley MSIT – IS and MSMITE programs 2024-2025 (while on SV Campus)**

**Advanced Study Option for students who matriculated in Spring 2023.**

**Applied Advanced Study Option for students who matriculated in Spring 2023.**

	Entire Program (SV Campus)	First Semester	
Program Tuition*	\$56,068	\$27,350	Prorated upon withdrawal/leave of absence. See Refund Policy provisions of this Enrollment Agreement. The amount quoted covers only the estimated tuition for the portion of the program provided in California.
Required University Fees	\$965	\$477	Non-Refundable after the 10th class day of the relevant semester. See Refund Policy provisions.
Books and Supplies (estimated)	\$2,212	\$1,106	Estimated cost for entire program. Used, digital and rented books and other factors may reduce/increase actual cost. The amount quoted covers only the estimated cost for the portion of the program provided in California.
Student Tuition Recovery Fund (STRF)	\$70	\$70	Non-Refundable (\$2.50 for every \$1,000 of net tuition** rounded to the nearest \$1,000). See information below about the STRF.
ESTIMATED TOTAL FEES/CHARGES FOR THE ENTIRE PROGRAM		\$59,315	
ESTIMATED TOTAL FEES/CHARGES FOR FIRST SEMESTER		\$29,003	
FEES/CHARGES DUE UPON ENROLLMENT		\$0	

## Financial Aid

### Carnegie Mellon University Consumer Information

Below is a summary of consumer information made available to all Carnegie Mellon University prospective and current students as required by the Higher Education Act of 1965, as amended. Required Disclosures have been categorized into five topics. Each disclosure gives a brief description of information that is required to be disclosed and explains how it can be obtained. This information may be changed from time to time as required.

If you need assistance or would like a paper copy, contact the Student Financial Aid Office, 5000 Forbes Avenue, Warner Hall, Pittsburgh, PA. If you wish to speak with a representative about the information contained here, please utilize the contact information found here:

<https://www.cmu.edu/hub/consumer-information/>.

### Information about the Institution:

#### Accreditation Information

Carnegie Mellon University is accredited by the Middle States Commission on Higher Education (MSCHE), 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104 ([www.msche.org](http://www.msche.org)). The Commission may be contacted by telephone at 267-284-5000 or via email at [info@msche.org](mailto:info@msche.org) or [espanolinfo@msche.org](mailto:espanolinfo@msche.org) (Spanish/Español). The university's current "Statement of Accreditation Status" can be found at, <https://www.msche.org/institution/>.

#### State Approvals

Carnegie Mellon University is licensed to operate in the states listed below. Individuals may contact the relevant agency for more information or information about how to file a complaint.

#### California

Bureau for Private Postsecondary Education  
P.O. Box 980818  
West Sacramento, CA 95798-0818  
Telephone: 888-370-7589  
Email: [bppe@dca.ca.gov](mailto:bppe@dca.ca.gov)  
Website: [www.bppe.ca.gov](http://www.bppe.ca.gov)

#### New York

New York State Education Department  
Office of Higher Education  
Room 977 Education Building Annex  
Albany, NY 12234  
Telephone: 518-486-3633  
Email: [hedepcom@nysed.gov](mailto:hedepcom@nysed.gov)  
Website: [www.highered.nysed.gov](http://www.highered.nysed.gov)

## Pennsylvania

Pennsylvania Department of Education  
Office of Postsecondary and Higher Education  
333 Market Street, 12th Floor  
Harrisburg, PA 17126-0333  
Telephone: 717-783-8228  
Email: [ra-collunivseminfo@pa.gov](mailto:ra-collunivseminfo@pa.gov)  
Website: [www.education.state.pa.us](http://www.education.state.pa.us)

## Washington, D.C.

Office of the State Superintendent of Education  
Government of the District of Columbia  
810 First Street NE 9th Floor  
Washington, DC 20002  
Telephone: 202-727-6436  
Email: [osse@dc.gov](mailto:osse@dc.gov)  
Website: [osse.dc.gov](http://osse.dc.gov)

Inquiries regarding the university's accreditation status or authorization to operate in any of the above states may be directed to: Associate Vice President / Director of Enrollment Services, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh PA 15213, telephone: 412-268-5399, email: [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu).

### Distance Education, State Authorization and Reciprocity Agreement (SARA)

The State Authorization Reciprocity Agreement (SARA) is an agreement among member states, districts, and territories in the United States, which establishes national standards for interstate offering of postsecondary distance education courses and programs. It is intended to standardize the process of offering online courses and programs by postsecondary institutions located in states other than the state in which the enrolled student(s) are residing. SARA is overseen by a national council (NC-SARA) and administered by four regional education compacts.

Carnegie Mellon University has been approved by the Commonwealth of Pennsylvania to participate in NC-SARA and was accepted as a SARA institution on May 2, 2017; additionally, Carnegie Mellon secured approval through NC-SARA on May 18, 2017. Carnegie Mellon University is listed as an approved, participating institution on the NC-SARA website (<http://www.nc-sara.org/>). At this time, 49 of the 50 United States are SARA members. California is not a member of SARA; however, Carnegie Mellon is able to offer online education to California residents.

Except where prohibited by applicable law, students who reside outside of the United States generally are not restricted from enrolling in our online programs. Some online programs do require in-person attendance at one of Carnegie Mellon's teaching locations (e.g., Carnegie

Mellon's Pittsburgh, Pennsylvania campus) for short portions of the program. Students interested in enrolling in a specific online program are encouraged to contact the person designated by the online program for questions about the program's requirements or enrollment.

### Copyright Infringement Policies

Carnegie Mellon University takes copyright violation seriously. Besides raising awareness about copyright law, it takes appropriate action in support of enforcement as required by policy and law. United States copyright law (<http://www.copyright.gov/>) "protects the original works of authorship fixed in any tangible medium of expression, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device".

The University's Fair Use Policy (<http://www.cmu.edu/policies/administrative-and-governance/fair-use.html>) states that all members of the University must comply with US copyright law and it explains the fair use standards for using and duplicating copyrighted material. In addition, the policy prohibits the duplication of software for multiple uses, meeting the Digital Millennium Copyright Act (DMCA) (<http://www.copyright.gov/legislation/dmca.pdf>) requirements. The DMCA criminalizes the development or use of software that enables users to access material that is copyright protected. Furthermore, the Computing Policy (<http://www.cmu.edu/policies/information-technology/computing.html>) prohibits the distribution of copyright protected material via the University network or computer systems, unless the copyright owner grants permission.

The Higher Education Opportunity Act of 2008 (Public Law 110-315) Section 488, requires institutions of higher education to annually inform students that "unauthorized distribution of copyrighted material, including unauthorized peer-to-peer file sharing, may subject the students to civil and criminal liabilities". Carnegie Mellon does this by publication of a news article on Computing Services' website or via mass mail communication each semester. The law goes on to require institutions "to provide a summary of penalties for violation of Federal copyright laws, including disciplinary actions that are taken against students who engage in unauthorized distribution of copyrighted materials using the institution's information system." Copyright protected materials can include, but are not necessarily limited to:

- Music
- Movies or other videos
- Literary works
- Software
- Digital images or libraries

### **Cost of Attending the University**

Actual tuition and fee charges can be found on the Student Financial Services' website at <https://www.cmu.edu/sfs/tuition/index.html>.

For estimated books and supplies, room and board, and personal/miscellaneous expenses view the cost of attendance for, Graduate program at <https://www.cmu.edu/sfs/tuition/graduate/index.html>.

## **Descriptions of Academic Programs**

Information on the university's graduate academic programs and degree offerings is available from the various schools/colleges and admitting offices. Links to those programs can be found at <https://www.cmu.edu/academics/index.html>.

## **Faculty**

Information on the university's faculty and instructional personnel is **available from individual schools/colleges. This information can be found on the university's academics website at** <https://www.cmu.edu/academics/index.html>.

## **Facilities & Services for Disabled Students**

The Office of Disability Resources provides responsive and reasonable accommodations to students who self-identify as having a disability, including physical, sensory, cognitive and emotional disabilities. If you would like to learn more about the services and accommodations provided by the Office of Disability Resources, visit their website at <https://www.cmu.edu/disability-resources/students/>. To discuss your accommodation needs, please email us at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) or call us at 412-268-6121 to set up an appointment.

## **Student Privacy & FERPA**

One of the most significant changes a parent or guardian experiences in sending a student to college is the difference in privacy standards for educational records. Carnegie Mellon values the student's right to privacy. The university adheres to a federal law called the Family Educational Rights and Privacy Act (also called FERPA or the Buckley Amendment) that sets privacy standards for student educational records and requires institutions to publish a compliance statement, including a statement of related institutional policies. For more detailed information, view the university's brochure at <https://www.cmu.edu/hub/privacy/ferpa-brochure.pdf>.

## **Return to Title IV Funds Policy and Procedural Statement**

### **Policy Reason**

The U. S. Department of Education requires that the university determine the amount of Federal Title IV aid earned by a student who withdrawals or fails to complete the period of enrollment. The university must determine the earned and unearned portions of Title IV aid as of the date the student ceased attendance based on the amount of time the student spent in attendance. Up through the 60% point in the period of enrollment, a pro rata schedule is used to determine the amount of Title IV funds the student has earned at the time of withdrawal. After the 60% point in the period of enrollment, a student has earned 100% of the Title IV funds he or she was scheduled to receive. For a student who withdraws after the 60% point-in-time, there are no unearned funds. Federal regulations can be found at:

## **Policy and Procedural Statement**

At Carnegie Mellon Title IV funds are awarded to a student under the assumption that the student will attend school for the entire period for which the assistance is awarded. When a student withdraws, the student may no longer be eligible for the full amount of Title IV funds that the student was originally scheduled to receive.

If a recipient of Title IV grant or loan funds withdraws from a school after beginning attendance, the amount of Title IV grant or loan assistance earned by the student must be determined. If the amount disbursed to the student is greater than the amount the student earned, the unearned funds must be returned. If the amount disbursed to the student is less than the amount the student earned, and for which the student is otherwise eligible, he or she is eligible to receive a Post-withdrawal disbursement of the earned aid that was not received.

Carnegie Mellon determines the Withdrawal Date and Date of Determination to complete the return calculation. A student's withdrawal date and date of determination varies depending on the type of withdrawal. When a student provides official notification to Carnegie Mellon through the Student Leave of Absence and Withdrawal Process, the withdrawal is defined as official withdrawal. When the student does not complete the Student Leave of Absence and Withdrawal Process and no official notification is provided by the student it is considered an unofficial withdrawal.

## **Leave of Absence/Withdrawal Process**

A student may leave Carnegie Mellon by either taking a leave of absence (leaving the university temporarily with the firm and stated intention of returning) or by withdrawing from the university (leaving the university with no intention of returning). Students choosing to take a leave of absence should first contact their academic advisor to discuss their plans while on leave and to work out any conditions that may be necessary for a smooth return to Carnegie Mellon. A student deciding to leave the university should take the following steps:

- Complete a Leave of Absence or Withdrawal Form.
- The form must include **all** necessary signatures or the process will not be completed.
- Return the completed form to the University Registrar's Office, 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213.

## **Determination of Withdrawal Date**

### Official Withdrawals (Notification Provided by the Student)

Those withdrawals defined as official are processed in accordance with federal regulations. The Office of the Registrar provides information that identifies which students have processed a Student Leave of Absence and Withdrawal Form for each semester. This information includes the Date of Withdrawal, the Date of Determination, Withdrawal/Leave Status (LA, LS, & W2) and the semester of attendance. This information is maintained in the student's academic file and in the university's Student Information System.

For students who notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is the earliest of:

- Date the student began the withdrawal or leave of absence process;
- Date the student notified his or her home department;
- Date the student notified the associate dean of his or her college; or
- Date the student notified the dean of students.

#### Unofficial Withdrawal (No Official Notification Provided by the Student)

For a student who withdraws without providing notification to Carnegie Mellon, the institution determines the withdrawal date using defined criteria. This category of withdrawals includes students that drop out and students that do not earn a passing grade.

To identify the unofficial withdrawals the Registrar develops a preliminary list of students that did not complete the semester by reviewing the final student grade reports. The list includes all students with: a) semester units carried, b) 0 semester units passed, c) 0 quality points earned, and d) 0.0 QPA. The Registrar contacts the academic divisions about each student to determine if the student actually completed the semester and earned the grades (0.0) or failed to complete the semester and did not notify the university of their status.

For students who do not notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is:

- The midpoint of the semester;
- The last date the student attended an academically related activity such as an exam, Tutorial or study group, or the last day a student turned in a class assignment.

#### Date of Determination that the Student Withdrew

Carnegie Mellon is not required to take attendance and the Date of Determination that a student withdrew varies depending upon the type of withdrawal: Official or Unofficial.

1. For withdrawals where the student **provided *Official Notification*** the Date of Determination is: The student's withdrawal date, or the date of notification, whichever is later.
2. For withdrawals where the student **did not provide *Official Notification*** the Date of Determination is: The date the institution becomes aware the student has ceased attendance.



For a student who withdraws without providing notification to the institution, the institution must determine the withdrawal date no later than 30 days after the end of the enrollment period.

### **Calculation of Earned Title IV Assistance**

The withdrawal date is used to determine the point in time that the student is considered to have withdrawn so the percentage of the period of enrollment completed by the student can be determined. The percentage of Title IV aid earned is equal to the percentage of the period of enrollment completed.

The amount of Title IV federal aid earned by the student is determined on a pro-rata basis up to the end of 60% of the semester. If the student completed 30% of a term, 30% of the aid originally scheduled to be received would have been earned. Once a student has completed more than 60% of a term, all awarded aid (100%) has been earned. The percentage of federal aid earned and the order in which the unearned aid is returned are defined by federal regulatory requirements.

The calculation of earned Title IV funds includes the following grant and loan funds if they were disbursed or could have been disbursed to the student for the period of enrollment for which the Return calculation is being performed:

- Pell Grant
- Iraq and Afghanistan Service Grant
- TEACH Grant (not available at Carnegie Mellon)
- FSEOG Grant
- Federal Direct Loan

### **Institutional Charges**

Institutional charges are used to determine the portion of unearned Title IV aid that the school is responsible for returning. Carnegie Mellon ensures that all charges for tuition, fees, room and board, as well as all other applicable institutional charges are included in the return calculation. Institutional charges do not affect the amount of Title IV aid that a student earns when he or she withdraws.

The institutional charges used in the calculation usually are the charges that were initially assessed the student for the period of enrollment. Initial charges are only adjusted by those changes the institution made prior to the student's withdrawal (for example, for a change in enrollment status unrelated to the withdrawal). If, after a student withdraws, the institution changes the amount of institutional charges it is assessing a student, or decides to eliminate all institutional charges, those changes affect neither the charges nor aid earned in the calculation.

## **Return of Unearned Funds to Title IV**

If the total amount of Title IV grant and/or loan assistance that was earned as of the withdrawal date is less than the amount that was disbursed to the student, the difference between the two amounts will be returned to the Title IV program(s) and no further disbursements will be made.

If a student has received excess funds, the College must return a portion of the excess equal to the lesser of the student's institutional charges multiplied by the unearned percentage of funds, or the entire amount of the excess funds.

The funds will be returned in the order below as prescribed by federal regulations, within 45 days from the date of determination that a student withdrew.

- Unsubsidized Federal Stafford Loans
- Subsidized Federal Stafford Loans
- Federal PLUS loans
- Federal Pell Grants
- Federal Supplemental Educational Opportunity Grants (FSEOG)

## **Post-Withdrawal Disbursements**

If the total amounts of the Title IV grant and/or loan assistance earned as of the withdrawal date is more than the amount that was disbursed to the student, the difference between the two amounts will be treated as a post-withdrawal disbursement. In the event that there are outstanding charges on the student's account, Carnegie Mellon will credit the student's account for all or part of the amount of the post-withdrawal disbursement up to the amount of the allowable charges.

Any amount of a post-withdrawal disbursement that is not credited to a student's account will be offered to the student within 30 days of the date that the institution determined that the student withdrew. Upon receipt of a timely response from the student, the College will disburse the funds within 90 days of the date of determination of the student's withdrawal date.

## Return of Title IV Funds – Withdrawals for Programs Offered in Modules

The return of Title IV funds for programs offered in modules is defined in a separate policy statement at Carnegie Mellon. This document is included as an addendum to the Carnegie Mellon University Return to Title IV Funds Policy and Procedural Statement (see below).

## Policies and Procedures

Federal Student Aid Handbook, Volume 5, Chapter 2 Withdrawals and the Return of Title IV Funds  
CFR 668.22 (a), (f) and (l)  
Dear Colleague Letter GEN-11-14 July 2011

For all programs offered in modules, a student is a withdrawal for Title IV purposes if the student ceases attendance at any point prior to completing the payment period or period of enrollment (unless the institution has written confirmation from the student that they will attend a module that begins later in the enrollment period).

The regulations require the institution to determine whether Title IV funds must be returned based on the number of days actually completed versus the number of days the student was scheduled to attend in the payment period. The regulations prevent students from enrolling in modules or compressed courses spanning the period, completing a portion of the period, and retaining all aid for the period.

A program is considered to be offered in modules if a course or courses in the program do not span the entire length of the payment period or period of enrollment. The rule impacts all programs offering courses shorter than an entire semester, including semester-based programs with a summer term consisting of two consecutive summer sessions.

The Student Financial Aid Office has established the following procedures associated with handling withdrawals from programs offered in modules. An Associate Director of Student Financial Aid has the primary responsibility for compliance and implementation of these regulatory requirements.

1. The institution will identify students enrolled for the summer session that are eligible for Title IV Aid.
  - Pell eligible students are identified
  - Students with summer loans are identified
  - The period of enrollment and enrollment status will be identified for each student
2. All Leave/ Withdrawal Forms processed by the University Registrar's Office will be reviewed for the summer sessions to record the Withdrawal Date and Date of Determination to identify any student receiving federal funding.
3. The Student Financial Aid Office will identify any students that drop courses in the summer sessions.
  - During Summer I this is standard procedure
  - During Summer II this is reviewed after 10th day reporting
  - Any additional dropped courses will be reviewed through the 60% enrollment period
4. Students who are identified as official withdrawals or that officially drop all courses in a session will be reviewed to determine the amount of federal financial aid earned. If a Return of Title IV aid is required, existing institutional procedures will be followed.
5. At the end of the enrollment period the institution will determine if any students are identified as 'unofficial withdrawals.' If a Return of Title IV aid is required, existing institutional procedures will be followed.
6. If a student does not begin courses in all sessions, a Return of Title IV aid may not be required, but other regulatory provisions concerning recalculation may apply.
  - If a student completes both courses in module one, but officially drops courses in module two while attending module one the student is not a withdrawal.
  - Since the enrollment is less than half time, the student is no longer eligible for the loan and the funds must be returned.

The following information obtained from the Federal Student Aid Handbook, Chapter 2, Withdrawals and the Return of Title IV Funds, will be used to determine whether a student enrolled in a series of modules is a withdrawal.

### **How to determine whether a student in a program offered in modules has withdrawn**

Schools can determine whether a student enrolled in a series of modules is a withdrawal by asking the following questions.

1. *After beginning attendance in the payment period or period of enrollment, did the student cease to attend or fail to begin attendance in a course he or she was scheduled to attend?*
  - If the answer is no, this is not a withdrawal.
  - If the answer is yes, go to question 2.
  
2. *When the student ceased to attend or failed to begin attendance in a course he or she was scheduled to attend, was the student still attending any other courses?*
  - If the answer is yes, this is not a withdrawal; however other regulatory provisions concerning recalculation may apply.
  - If the answer is no, go to question 3.
  
3. *Did the student confirm attendance in a course in a module beginning later in the period (for non-term and nonstandard term programs, this must be no later than 45 calendar days after the end of the module the student ceased attending)?*
  - If the answer is yes, this is not a withdrawal, unless the student does not return.
  - If the answer is no, this is a withdrawal and the Return of Title IV Funds requirements apply.

Contact: Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412-268-1353.

### **Satisfactory Academic Progress Policy and Procedural Statement**

To be eligible for federal, state, and institutional financial aid, all students are required to maintain Satisfactory Academic Progress toward the completion of a degree. Each university determines its own policy in accordance with federal regulations set forth by the U. S. Department of Education regarding satisfactory progress standards to ensure student success. To maintain Satisfactory Academic Progress at Carnegie Mellon University, students must meet the following minimum standards for both of the qualitative (QPA) and quantitative (completion rate) measures:

Student Type	QPA (Qualitative)	Completion Rate (Quantitative)*
First Year Undergraduate	1.75	80%
Undergraduate Upper-class	2.00	80%
Heinz Graduate	3.00	80%
Other Graduate (excluding Tepper)	2.00	80%

*\*To calculate the completion rate, the cumulative number of completed units is divided by the cumulative number of units attempted. Advance Placement credits are excluded from both figures.*

In addition to the above-mentioned Financial Aid Satisfactory Academic Progress standards, federal regulations require a student to complete their degree within a specified amount of time. The maximum timeframe cannot exceed 150 percent of the time published as needed for completion of the program.

Scope:

This policy applies to Federal aid including Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Work-Study, Federal Direct Loans, and Federal Direct PLUS Loan programs; state grant aid; and Carnegie Mellon institutional aid including grants, loans, and scholarships.

Federal regulations can be found at,

Federal Student Aid Handbook, Volume 1  
 Chapter 1 School Determined Requirements  
 34 CFR 668.16(e)  
 34 CFR 668.32(f)  
 34 CFR 668.34

## **Evaluation**

Carnegie Mellon evaluates all students for Financial Aid Satisfactory Academic Progress annually, at the end of the spring semester. Students that are included in the review are undergraduates, graduates, both full-time and part-time.

Courses that do not count toward a student's degree cannot be used to determine enrollment status for financial aid purposes. Carnegie Mellon will count transfer credit hours that are accepted toward a student's educational program as both attempted hours and completed hours. Advanced Placement Non-Degree and Non-Credit courses are not counted as units passed or attempted. When a course is repeated, all grades will be recorded on the official academic transcript and will be calculated in the student's QPA. For financial aid eligibility, only one repeat per course is permitted in the determination of enrollment status for courses previously passed.

If the student withdraws and is not assigned a W grade, then it will not be counted in the number of units attempted or completed. If the W grade is assigned, the units will be counted in the number of units attempted and will be counted as zero in the number of units completed.

If the student has incomplete units, the units will be counted as attempted and will be counted as zero in the number of units completed.

The Financial Aid Satisfactory Academic Progress evaluation is a cumulative review of all semesters, regardless of whether or not the student received financial aid during the academic year.

If the minimum requirements are not achieved, the student is ineligible to receive financial aid. In such a case, the student is notified and given an option to appeal their financial aid status. More information about the appeal process can be found at <https://www.cmu.edu/sfs/financial-aid/policies/academic-progress.html>.

A financial aid package will not be completed unless an appeal is received, approved and processed accordingly. If by chance a financial aid package is processed and released to the student, it is conditional and subjected to financial aid removal until an appeal is received, approved and processed accordingly.

**Contact:** Accountable Department: Enrollment Services, Student Financial Aid. Questions regarding this policy or its intent should be directed to the Student Financial Aid Office, phone: 412-268-1353.

### **Student Body Diversity**

For Information about the diversity of the university student body, contact the Institutional Research and Analysis Office, <https://www.cmu.edu/ira/index.html>.

For information about the University's Diversity, Equity and Inclusion initiative, visit the Center for Student Diversity and Inclusion's website at <https://www.cmu.edu/student-diversity/>.

### **Written Arrangement Information**

A U.S. Department of Education regulation requires disclosure of specific information to prospective and current students regarding written arrangements between Carnegie Mellon University (CMU) and any institution(s) that provides a portion of an educational program to students enrolled at CMU. CMU enters into such arrangements to enrich the educational experiences offered to its students. In accordance with the regulation, CMU provides this information at <http://www.cmu.edu/hub/consumer-information/docs/written-arrangement.pdf>.

### **Student Complaints & Consumer Information by State**

As required for compliance with U.S. Federal Program Integrity Regulations, state official/agency contact information for each U.S. state/territory that could handle a student's complaint is provided at <https://www.cmu.edu/hub/consumer-information/docs/complaints.pdf>.

## Gainful Employment Disclosures

As required by U.S. Department of Education regulations Gainful Employment Disclosures (Disclosures about CMU certificate programs that prepare students for specific occupations) can be found at <https://www.cmu.edu/hub/consumer-information/>.

## Information about Student Financial Aid:

Meeting the cost of higher education is a significant investment. We are committed to providing a comprehensive financial aid program that makes it possible for admitted students to attend Carnegie Mellon.

### Application Process & Timeline:

Graduate Students: **To apply for financial aid for the 2024-2025 academic year, follow the steps below:**

#### 1. Free Application for Federal Student Aid (FAFSA)

The FAFSA is required if applying for federal financial aid programs. There are now two ways to complete the *Free Application for Federal Student Aid (FAFSA)* form: a redesigned <https://studentaid.ed.gov/sa/fafsa> website or a mobile app (available through Google Play, <https://play.google.com/store/apps/details?id=com.fsa.mystudentaid> or the Apple App Store, <https://itunes.apple.com/us/app/mystudentaid/id1414539145>).

We recommend using the IRS Data Retrieval Tool (DRT) (<https://studentaid.ed.gov/sa/resources/irs-drt-text>) to complete the FAFSA. The DRT transfer process has been improved to include stronger security and privacy protections; therefore, tax information transferred will not display on the form or Student Aid Report. Instead, the phrase "Transferred from the IRS" will appear in the fields.

Those selected for federal verification after FAFSA completion or those unable to use the IRS DRT will need to request an IRS Tax Return Transcript (<https://www.irs.gov/individuals/get-transcript>).

### Additional information:

- Apply as soon as possible after October 1.
- Carnegie Mellon's federal code is 003242.
- Use 2023 tax information to complete the FAFSA.
- A Department of Education Federal Student Aid (FSA) ID is required. View FSA ID instructions at <https://fsaid.ed.gov/npas/index.htm>.
- Students must complete the FAFSA's electronic signature requirement.

#### 2. MPN & Entrance Counseling

All first-time Federal Direct Loan borrowers are required to complete entrance counseling. The entrance counseling session provides information about borrower rights and responsibilities. CMU will be notified when a student has completed online entrance counseling. Funds will not be disbursed until the entrance counseling session has been completed. Students who completed a federal entrance counseling session while at CMU, do not have to complete another session.

Additional information:

- View entrance counseling instructions (<https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/mpn-entrance-counseling.html>).
- Complete entrance counseling session at <https://studentloans.gov>.

### 3. Grad PLUS Loan

If you plan on borrowing a Federal Direct Graduate PLUS Loan, this is a two-part process and both parts must be completed in order for your loan to be originated. If you borrowed a Grad PLUS Loan last academic year, you are only required to complete the application portion of the process. The application portion of the process cannot be completed before June 1, 2024.

Additional information:

- View detailed Grad PLUS Loan instructions at <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/plus/instructions.html>.
- The two-part process may be completed at <https://studentloans.gov>.

### Financial Aid Eligibility Notification

Once a student completes all of the steps above, a financial aid package will be determined. The Student Financial Aid Office will notify the student by email that a financial aid award letter has been posted to SIO (<https://s3.andrew.cmu.edu/sio>). The letter contains information and further instructions regarding the student's eligibility and awards. If a student's circumstances change, then financial aid eligibility will be re-evaluated and the student will receive notification that a revised award letter is available in SIO.

### Missing Documents

If we are unable to process a student's financial aid package due to missing documents, a Financial Aid Alert email will be sent to the student requesting the required documents by a specified date. Until the entire application process is completed and all required documents are submitted, our office may be unable to complete a student's financial aid package. Students may log in to SIO (<https://s3.andrew.cmu.edu/sio>) to view documents that have been received by our office. [View instructions](https://www.cmu.edu/sfs/financial-aid/missing-documents/index.html) for submitting missing documents at <https://www.cmu.edu/sfs/financial-aid/missing-documents/index.html>.

### Teacher Certification

Teacher certification students at the graduate level should be aware that federal regulations classify them as a grade level 5 undergraduate student for Federal Direct Student Loan purposes.



Teacher certification students are, however, considered a graduate student by Carnegie Mellon for academic purposes.

## **Available Financial Aid**

### **Scholarships & Grants**

Graduate students interested in scholarships and grants may contact their program of interest or department. View more information on the Office of Graduate and Postdoctoral Affairs website, <https://www.cmu.edu/graduate/prospective/index.html>. In addition, the Office of Undergraduate Research and Scholarships (<http://www.cmu.edu/fso/>) provides support to graduate students interested in pursuing certain external scholarships, like Fulbright and UK Awards.

### **Federal Work-Study**

Federal Work-Study (FWS) is a need-based self-help award. If a student has been awarded FWS, the FWS award is the total that can be earned during the academic year as a work-study student.

### **Federal Loans**

For many students and families, educational loans are a necessary part of the process of paying for college. Student Financial Aid certifies loans for students, as well as Federal Direct Parent PLUS Loans for parents of undergraduates and Federal Direct Grad PLUS Loans for graduate students.

### **Federal Direct Student Loan**

The Federal Direct Student Loan is the most widely-used loan for college students and is available to both undergraduate and graduate students. There are two types of Federal Direct Student Loans, subsidized and unsubsidized, and eligibility for both is determined by completing the FAFSA.

### **Grad PLUS Loan**

Eligible graduate students may borrow a Federal Direct Grad PLUS Loan to assist with educational expenses. Students may borrow any amount up to their calculated cost of attendance minus any other aid received.

### **Private Loans**

Private loan programs offer competitive interest rates and borrower benefits. To increase chances of approval and possibly improve the rate you receive, students are strongly recommended to apply with a creditworthy co-signer.

## **Student Outcomes**

### **Retention and Graduation Rates**

Institutional Research and Analysis Office offers up-to-date data on degrees conferred, enrollment reports, freshmen retention rates and race and ethnicity reports for annual degrees. Retention and Graduation rates can be found at <https://www.cmu.edu/ira/retentiongradrates.html>.

Intercollegiate Athletic Program Participation Rates and Financial Support Data (Equity in Athletics Disclosure Act)

Please visit the U.S. Department of Education's site, The Equity in Athletics Data Analysis (<http://ope.ed.gov/athletics/#/>) and select the "Get data for one schools" option. Enter "Carnegie Mellon University" in the "Name" field and select the "Continue" button at the bottom of the page.

A printed copy of the report can be requested by calling the Department of Athletics, Physical Education, and Recreation at 412-268-8054 or by sending an email to Josh Centor, Associate Vice President for Student Affairs and Director of Athletics, Physical Education & Recreation, at [jcentor@andrew.cmu.edu](mailto:jcentor@andrew.cmu.edu).

## **Health and Safety**

### **Drug and Alcohol Abuse Prevention Program**

Under the Drug Free Workplace Act of 1988 and the Drug Free Schools and Campuses Act of 1989, the Carnegie Mellon University is required to have an alcohol and other drug policy outlining prevention, education and intervention efforts and consequences for policy violations. The policy can be found at <https://www.cmu.edu/policies/administrative-and-governance/alcohol-and-drug-policy.html>.

### **CMU Annual Security and Fire Safety Report**

A printed copy of the report can be requested by contacting University Police at 412-268-6232 or [campuspd@andrew.cmu.edu](mailto:campuspd@andrew.cmu.edu).

The annual security and fire safety report (Carnegie Mellon University Police Department Annual Reports) is also available online at <https://www.cmu.edu/police/reporting-policy-training/security-firesafety-reports.html>.

### **Vaccination Policies**

CMU Prematriculation Immunization Policy can be found at <http://www.cmu.edu/policies/student-and-student-life/immunizations.html>.

CMU University Health Services Health Requirements for Incoming Students can be found at <https://www.cmu.edu/health-services/new-students/>.

## **Other Information**

### **Voter Registration**

Please visit <https://www.usa.gov/voter-registration>.

### **Carnegie Mellon Ethics Hotline**

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity relating to financial matters, academic and student life, human relations, health and campus safety or research.

Students, faculty and staff can anonymously file a report by calling 877-700-7050 or visiting [www.reportit.net](http://www.reportit.net) (user name: tartans; password: plaid). All submissions will be reported to appropriate university personnel.

*The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.*

### **Statement of Assurance**

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the vice president for campus affairs, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.

### **Student Loan Repayment Obligation**

If you obtain a loan to pay for INI Pittsburgh-Silicon Valley MSIT-IS or MSMITE programs including any of the Study options (Applied, Advanced, Applied Advanced), you will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If you have received federal student financial aid funds, you are entitled to a refund of moneys not paid from federal student financial aid program funds.

## Pending Bankruptcy Disclosure

CMU does not have a pending petition in bankruptcy, is not operating as a debtor in possession, and has not filed a petition in bankruptcy within the preceding 5 years, nor has Carnegie Mellon had a petition in bankruptcy filed against it within the preceding 5 years that resulted in re-organization under Chapter 11 of the United States Bankruptcy Code.

## Student Services

### Student Affairs

Students on the Silicon Valley campus can meet with Lauren Schachar, Assistant Dean of Student Affairs, for on-site connection to various student services resources. These resources include questions regarding public transportation, health, personal concerns, student organizations, activities and general campus information. Lauren Schachar's office is located in B23 Room 217, and she can be reached by phone at (650) 335-2844 or email at [lauren.schachar@sv.cmu.edu](mailto:lauren.schachar@sv.cmu.edu).

### Public Transportation

Currently enrolled CMU-SV students are eligible for the **VTA ecopass**, valid for unlimited rides on all VTA bus and light rail lines in Santa Clara County, including express service. Ecopasses are part of the Clipper Card system, a reloadable smart pass/ID card issued by CMU-SV to each individual. The ecopass is not valid on CalTrain, BART, SamTrans or SF Muni, but holders have the ability to add other passes and fares from other Bay Area agencies to the same card for greater convenience. Additionally, if you live or work along the CalTrain route, please [contact Student Services](#) for more information regarding how to get a Go Pass.

[More about Clipper Cards Opens in new window](#), including how to load fares for other agencies (BART, AC Transit, MUNI).

### Health/Personal Concerns

The Assistant Dean of Student Affairs is the point person for any student who is in distress or experiencing a crisis. Student Affairs consults with CMU's Counseling and Psychological Services (CaPS) in Pittsburgh to support students in these circumstances. The assistant dean also works closely with CaPS to provide training for SV faculty on identifying and supporting students in distress.

To further promote student access to physical and mental health services, the campus contracts with One Medical to provide students with local, timely access to health care. All students, staff, and faculty are able to enroll in a free membership to One Medical, which provides same day and next day appointments at any of their locations. There are three main locations near the SV campus. The company also provides 24/7 support via their mobile app, including video consultations with a physician. All full-time students are also required to have health insurance.

CMU's student health insurance department helps students to enroll, waive (if they have insurance that meets the university requirements), navigate and use insurance. Questions regarding student insurance can be emailed to [shinsure@andrew.cmu.edu](mailto:shinsure@andrew.cmu.edu).

## **Student Organizations and Activities**

CMU-SV holds a variety of student events to help connect students to the campus, staff, faculty, and each other! These events are open for all CMU-SV students. Students are encouraged to join student organizations. Students interested in joining the Student Activities Committee (The Fun Squad) or finding more information can contact [student-services@sv.cmu.edu](mailto:student-services@sv.cmu.edu) or your Student Affairs Office.

Student activities are promoted through a weekly CMU-SV Student Newsletter sent by the Assistant Dean of Student Affairs. Students can find out about opportunities, events and activities through the newsletter, the student events calendar (which they can access once they have set up their school Google account) and through the digital displays and posters on campus.

## **Career Services**

The INI Career Services Office strives to bring together the talents of our students with professional opportunities, including:

- Internships
- Full-time jobs
- Practicum projects
- Research sponsorships
- Fellowship and scholarship support

At the INI, the students learn and develop professionally as much beyond the walls of our classrooms as they do in lecture halls and laboratories. They may contribute to real-world research, fulfill valuable internships and complete team-based projects for clients.

To this end, the INI career services office facilitates partnerships with representatives in industry, government and academia. The office also specializes in providing career counseling to students.

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.

Students in Silicon Valley can meet with Associate Director of Career Services, Leigh Oliveras. Appointments can be made through Handshake.

## **Job Search Guidelines**

Departments strive 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 their job search in a manner that does not impede the academic progress through their graduate program. It is also important for students to understand 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 their ethical job/internship search policy. Students who do not follow such guidelines may forfeit their on campus interviewing and/or resume submission privileges.

## **Student Grievances**

Grievances can be brought directly to the Assistant Dean of Student Affairs. For students who wish to submit a concern online, they can do so at the online Student Suggestions Box at <http://goo.gl/forms/BySIZMoB6txYDKz02>.

A list of employment positions within the education field for the INI MSIT-IS, MSIT-IS Applied, MSIT-IS Advanced, MSIT-IS Applied Advanced, MSMITE, MSMITE-Applied, MSMITE-Advanced, and MSMITE-Applied Advanced programs graduates as of 2023 is available at: <https://www.cmu.edu/ini/academics/bicoastal/2023bicoastalprogramsemploymentpositions.pdf>.

The INI Career Services disclosure statement is available online at: [https://www.cmu.edu/ini/academics/bicoastal/bppecareerservices\\_bicoastalprograms-2023.pdf](https://www.cmu.edu/ini/academics/bicoastal/bppecareerservices_bicoastalprograms-2023.pdf).

## **Services to International Students**

Carnegie Mellon University does admit students from other countries. The Carnegie Mellon Office of International Education (OIE) provides visa services for F-1 and J-1 international students as required by Department of Homeland Security regulations. These services, and related services such as advising and preparation of required documents, are provided to students at no additional charge.

OIE advises international students and scholars regarding immigration/visa and acculturation issues, issues visa documents with which international students and scholars may apply for US visas. Visa documents are issued, per federal regulations, upon request from students who are admitted to full-time programs and who have sufficient, demonstrated financial resources. OIE complies with federal reporting requirements with respect to students/scholars on CMU visa

documents and educates students with respect to their own responsibilities for maintaining legal status in the US.

All F and J students/scholars are required to attend a mandatory Orientation and Immigration Check-In upon arrival to their CMU campus or location. The OIE orientation provides legally required information regarding maintaining status. For those students who participate in Optional Practical Training (OPT) or Curricular Practical Training (CPT), mandatory information/application sessions are provided. These sessions are presented remotely, as needed, by a Carnegie Mellon OIE Designated School Official (DSO). Individual students who have immigration questions or concerns meet with designated OIE advisor during individual, scheduled advising appointments.

For more information, students may view the website or call OIE:

<https://www.cmu.edu/oie/>

By phone: 1(412) 268-5231

## **Local Housing**

The CMU campus in Silicon Valley does not offer any on-campus housing or off-campus housing services. Students need to find their own housing. There are many apartment complexes and/or room rentals within a commutable distance from the campus. Housing costs vary and most students choose to have roommates. [View a range of housing prices in the Mountain View area.](#)

While our student affairs office cannot act as a real estate agency or rental broker for you, we are happy to offer our advice or suggestions on locations that may be of interest to you. For questions, please contact the Assistant Dean of Student Affairs at [student-services@sv.cmu.edu](mailto:student-services@sv.cmu.edu)

## **Facilities and Equipment**

The Silicon Valley campus is located in the historic Shenandoah Plaza on the NASA Ames Research Park. CMU-SV occupies building 23.

Building 23 is a 20,111 sq. ft. two-story historic building and is our main administrative and teaching building. It largely houses our academic space: 6 classrooms, 26 faculty and staff offices, 7 conference rooms, 3 meeting rooms, 2 kitchen/break rooms, 1 cafe lounge, and 1 multi-function lounge & event space. Located in the annex of Building 23 is the Carnegie Mellon Innovations Lab (CMIL), a 1,247 sq. ft. multi-use lab space.

An active CMU ID card is required for access to the campus buildings. Student CMU ID cards work as a swipe key to enter Building 23 outside of business hours. Building 23 business hours are weekdays 7:00 a.m. - 9:00 p.m. All doors are locked on weekends and during holidays.

More information about the rooms and spaces the CMU-SV campus is available at <http://sv.cmu.edu/information-center/campus-resources/rooms-and-spaces.html>.

The complete CMU-SV Facilities and Campus Policies can be found at <http://sv.cmu.edu/information-center/campus-resources/facilities-and-campus-policies.html>.

Information about technology resources is available at <https://sv.cmu.edu/information-center/technology-resources/index.html>.

For building, maintenance, office or equipment requests, email [facilities@sv.cmu.edu](mailto:facilities@sv.cmu.edu).

## Library and Resources

Carnegie Mellon Silicon Valley does not operate a library on campus, but we do have specialized library resources available for students, faculty, and staff. Silicon Valley Campus Guide (<http://guides.library.cmu.edu/svc>) resources include:

1. Interlibrary Loan
2. e-book developments
3. University Libraries Quick Links

Through the Interlibrary loan, students can request books, articles from journals and conferences, technical reports, or other materials to be sent to you. The materials may be from Carnegie Mellon libraries in the U.S. or other institutions worldwide. Electronic delivery for many articles is available. ILLiad is the system that our students use to request these items. What ILLiad can be used for:

- To request to borrow a book, a tech report, a thesis, copy of an article, etc.
- Check status of requests
- Edit requests
- Cancel requests
- Update your contact information or delivery preferences
- Request to renew an interlibrary loan

The ILLiad link can be found at <https://illiad.library.cmu.edu/illiad/illiad.dll>.

The first time you use the link you need to provide information about yourself. You only need to do this once. When completing the form, choose these options:

- For Mailing Address, state: Silicon Valley campus
- For Delivery Location, state: E&S Library

Ebook developments can be found on our website at <http://guides.library.cmu.edu/svc>. See below for an example of ebook developments:

- [AccessEngineering](#)
  - This is a "reference tool for professionals, academics, and students that provides seamless access to the world's best-known, most-used collection of authoritative, regularly updated engineering reference information. AccessEngineering also comprises dynamic online features, such as instructional, faculty made videos,



[calculators](#), interactive tables and charts, as well as personalization tools allowing users to organize crucial project information as they work." AccessEngineering includes the well-known [Schaum's Outline](#) series of books.

- [Knovel](#)
  - A digital collection of science and engineering reference books. Carnegie Mellon Users Only (including Silicon Valley Campus). Our access to their new collection on Computer Hardware Engineering is now available! You'll also find the books listed in CAMEO - our online catalog.
- [Synthesis Digital Library of Engineering and Computer Science](#)
  - "The basic component of the library is a 50- to 100-page 'Lecture'; a self-contained electronic book that synthesizes an important research or development topic, authored by an expert contributor to the field." You'll also find the books listed in CAMEO - our online catalog.
- [Springer e-Books Collection for Computer Science](#)
- [Springer e-Book Collection for Engineering](#)
- [Springer e-Book Collection for Mathematics & Statistics](#)
- [Plus - General e-Book Collecting from Many Different Publishers](#)

University Quick Links can also be found on the website at <http://guides.library.cmu.edu/svc>.

- [Articles & Databases](#)
  - Alphabetical and subject listings of our available databases.
- [Cybersecurity](#)
- [e-Journals A to Z List](#)
  - Our automated (partially) method of finding e-Journals that we have access to - even if buried in a full-text database.
- [ECE Library Guide](#)
  - Library research guide for Electrical & Computer Engineering.
- [Off-Campus / Wireless Access](#)
  - EZ Proxy single sign on added as an option!
- [University Libraries Home Page](#)
  - Our home page has links to the simple and advanced search functions for CAMEO - our online catalog.

For additional questions regarding library resources, please contact Haoyong Lan, Engineering Librarian at [haoyonglan@cmu.edu](mailto:haoyonglan@cmu.edu) or by phone: 412-268-2443

Detailed description of the library resources is available at <http://sv.cmu.edu/student-services/library-resources.html>.

## Student Tuition Recovery Fund

The State of California established the Student Tuition Recovery Fund (STRF) to relieve or mitigate economic loss suffered by a student in an educational program at a qualifying institution, who is or was a California resident while enrolled, or was enrolled in a residency program, if the student enrolled in the institution, prepaid tuition, and suffered an economic loss. Unless relieved of the obligation to do so, you must pay the state-imposed assessment for the STRF, or it must be paid on your behalf, if you are a student in an educational program, who is a California resident, or are enrolled in a residency program, and prepay all or part of your tuition.

You are not eligible for protection from the STRF and you are not required to pay the STRF assessment, if you are not a California resident, or are not enrolled in a residency program.

It is important that you keep copies of your enrollment agreement, financial aid documents, receipts, or any other information that documents the amount paid to the school. Questions regarding the STRF may be directed to the Bureau for Private Postsecondary Education, 1747 N. Market Boulevard, Suite 225, Sacramento, CA 95834, (916) 574-8900 or (888) 370-7589.

To be eligible for STRF, you must be a California resident or are enrolled in a residency program, prepaid tuition, paid or deemed to have paid the STRF assessment, and suffered an economic loss as a result of any of the following:

1. The institution, a location of the institution, or an educational program offered by the institution was closed or discontinued, and you did not choose to participate in a teach-out plan approved by the Bureau or did not complete a chosen teach-out plan approved by the Bureau.
2. You were enrolled at an institution or a location of the institution within the 120 day period before the closure of the institution or location of the institution, or were enrolled in an educational program within the 120 day period before the program was discontinued.
3. You were enrolled at an institution or a location of the institution more than 120 days before the closure of the institution or location of the institution, in an educational program offered by the institution as to which the Bureau determined there was a significant decline in the quality or value of the program more than 120 days before closure.
4. The institution has been ordered to pay a refund by the Bureau but has failed to do so.
5. The institution has failed to pay or reimburse loan proceeds under a federal student loan program as required by law or has failed to pay or reimburse proceeds received by the institution in excess of tuition and other costs.
6. You have been awarded restitution, a refund, or other monetary award by an arbitrator or court, based on a violation of this chapter by an institution or representative of an institution, but have been unable to collect the award from the institution.
7. You sought legal counsel that resulted in the cancellation of one or more of your student loans and have an invoice for services rendered and evidence of the cancellation of the student loan or loans.

To qualify for STRF reimbursement, the application must be received within four (4) years from the date of the action or event that made the student eligible for recovery from STRF.

A student whose loan is revived by a loan holder or debt collector after a period of non-collection may, at any time, file a written application for recovery from STRF for the debt that would have otherwise been eligible for recovery. If it has been more than four (4) years since the action or event that made the student eligible, the student must have filed a written application for recovery within the original four (4) year period, unless the period has been extended by another act of law.

However, no claim can be paid to any student without a social security number or a taxpayer identification number.

## NOTICE CONCERNING TRANSFERABILITY OF CREDITS AND CREDENTIALS EARNED AT OUR INSTITUTION

The transferability of credits you earn at CMU is at the complete discretion of an institution to which you may seek to transfer. Acceptance of the degree and diploma you earn in the INI Pittsburgh - Silicon Valley MSIT-IS, MSIT-IS Applied, MSIT-IS Advanced, MSIT-IS Applied Advanced, MSMITE, MSMITE-Applied, MSMITE-Advanced, and MSMITE-Applied Advanced programs is also at the complete discretion of the institution to which you may seek to transfer. If the units or degree, or diploma that you earn at this institution are not accepted at the institution to which you seek to transfer, you may be required to repeat some or all of your coursework at that institution. For this reason, you should make certain that your attendance at this institution will meet your educational goals. This may include contacting an institution to which you may seek to transfer after attending CMU to determine if your units, or degree, or diploma will transfer.

# Carnegie Mellon University

## Consumer Information



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## Section 1: Consumer Information

The Higher Education Opportunity Act (HEOA) was enacted on August 14, 2008, and reauthorized the Higher Education Act of 1965, as amended (HEA). These federal regulations govern the federal Title IV



financial aid programs and include several student consumer information disclosure requirements as well as reporting requirements for institutions participating in the federal financial aid programs. This reporting ranges from general information about an institution, to its educational programs and services, to its policies, and student outcomes. Carnegie Mellon makes all required consumer information disclosures readily available, including through our website at <https://www.cmu.edu/hub/consumer-information/> and through individual notifications to students when required or upon request.

Additionally, parents and students are welcome to contact Lisa Krieg, Associate Vice President and Director of Enrollment Services, at [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu), for questions regarding any reporting area or to request a paper copy of the Student Consumer Information document.

## Section 2: Accreditation and Licensing of the Institution

Carnegie Mellon University is accredited through a voluntary, peer-review process coordinated by the Middle States Commission on Higher Education (MSCHE or Middle States). The aim of the accreditation process is to ensure current and future students and the public that the university is providing a high-quality educational experience for students.

In the 2017-2018 academic year, a team of external reviewers from peer universities visited CMU to evaluate the university's educational and administrative activities. In preparation for that visit, CMU conducted a formal Self-Study (see <https://www.cmu.edu/middlestates/2018-self-study/index.html>) that engaged many faculty and staff from all over the university, in Pittsburgh and around the world. Faculty and staff composing Self-Study Groups (see <https://www.cmu.edu/middlestates/2018-self-study/working-groups.html>) and the peer evaluation team (see <https://www.cmu.edu/middlestates/2018-self-study/peer-evaluation-team.html>) often make suggestions or recommendations for improvement of CMU's activities and operations.

Please visit the pages within this site to learn more about accreditation standards and processes and to view the university's reaccreditation reports.

MSCHE is one of six regional accrediting agencies in the United States, each accrediting institutions of higher education within a specific geographic region. Middle States is recognized by the U.S. Department of Education. This recognition enables MSCHE's member institutions to establish eligibility to participate in federal financial aid programs (e.g., federal loans, grants, and work-study) administered by the U.S. Department of Education. Carnegie Mellon University has been accredited by Middle States since 1921.

The address and telephone number for the Middle States Commission on Higher Education is 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104, (267) 284-5000. To contact MSCHE by email, please use [info@msche.org](mailto:info@msche.org) or Spanish/Español [espanolinfo@msche.org](mailto:espanolinfo@msche.org).

The university's current "Statement of Accreditation Status" can be found at, <https://www.msche.org/institution/0476/>.

Inquiries regarding the University's accreditation status or authorization to operate in any of the above states may be directed to: Associate Vice President/Director of Enrollment Services, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone: 412.268.5399, email: [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu).

Carnegie Mellon University is licensed to operate in the states listed below. Individuals may contact the relevant agency for more information or information about how to file a complaint.

### **California**

Bureau for Private Postsecondary Education  
P.O. Box 980818  
West Sacramento, CA 95798-0818  
Telephone: 888-370-7589  
Email: [bppe@dca.ca.gov](mailto:bppe@dca.ca.gov)  
Website: [www.bppe.ca.gov](http://www.bppe.ca.gov)

### **New York**

New York State Education Department  
Office of Higher Education  
Room 977 Education Building Annex  
Albany, NY 12234  
Telephone: 518-486-3633  
Email: [hedepcom@nysed.gov](mailto:hedepcom@nysed.gov)  
Website: [www.highered.nysed.gov](http://www.highered.nysed.gov)

### **Pennsylvania**

Pennsylvania Department of Education  
Office of Postsecondary and Higher Education  
333 Market Street, 12th Floor  
Harrisburg, PA 17126-0333  
Telephone: 717-783-8228  
Email: [ra-collunivseminfo@pa.gov](mailto:ra-collunivseminfo@pa.gov)  
Website: [www.education.state.pa.us](http://www.education.state.pa.us)

### **Washington, D.C.**

Office of the State Superintendent of Education  
Government of the District of Columbia  
810 First Street NE 9th Floor  
Washington, DC 20002  
Telephone: 202-727-6436  
Email: [osse@dc.gov](mailto:osse@dc.gov)  
Website: [osse.dc.gov](http://osse.dc.gov)

### Section 3: Distance Education, State Authorization and Reciprocity Agreement (SARA)

The State Authorization Reciprocity Agreement (SARA) is an agreement among member states, districts, and territories in the United States, which establishes national standards for interstate offering of postsecondary distance education courses and programs. It is intended to standardize the process of offering online courses and programs by postsecondary institutions located in states other than the state in which the enrolled student(s) are residing. SARA is overseen by a national council (NC-SARA) and administered by four regional education compacts.

Carnegie Mellon University has been approved by the Commonwealth of Pennsylvania to participate in NC-SARA and was accepted as a SARA institution on May 2, 2017; additionally, Carnegie Mellon secured approval through NC-SARA on May 18, 2017. Carnegie Mellon University is listed as an approved, participating institution on the NC-SARA website (<http://www.nc-sara.org/>). At this time, 49 of the 50 United States are SARA members. California is not a member of SARA; however, Carnegie Mellon is able to offer online education to California residents.

Except where prohibited by applicable law, students who reside outside of the United States generally are not restricted from enrolling in our online programs. Some online programs do require in-person attendance at one of Carnegie Mellon's teaching locations (e.g., Carnegie Mellon's Pittsburgh, Pennsylvania campus) for short portions of the program. Students interested in enrolling in a specific online program are encouraged to contact the person designated by the online program for questions about the program's requirements or enrollment.

### Section 4: Student Complaints & Consumer Information by State

Students should first attempt to handle complaints in consultation with their academic department and the university's Vice Provost for Education at [vpe@andrew.cmu.edu](mailto:vpe@andrew.cmu.edu). Unresolved complaints may be directed to the official complaint agency in the state or U.S. territory in which your state (or U.S. territory) is located. Through the university's participation in the State Authorization Reciprocity Agreement (SARA), you may access contact information for your state agency and instructions for filing complaints in your state using the SARA State Authorization Guide at <https://nc-sara.org/guide/state-authorization-guide>. If your state's complaint process is inadequate, complaints may be directed to the official complaint agency in the state or U.S. territory in which your CMU campus, additional location or other instructional site is

### Section 5: Professional Licensure Disclosures at the State Level

In accordance with Title 34 Code of Federal Regulations Part 668.43(a)(5)(v) regarding information educational institutions must make readily available to enrolled and prospective students, Carnegie Mellon is providing the following professional licensure/certification disclosures:

## School of Architecture

The Bachelor of Architecture (B.Arch) and the Master of Architecture (M.Arch) degree programs are National Architecture Accrediting Board (NAAB)-accredited degree programs and meet the *educational requirements* for architectural licensure in all US States and the District of Columbia. Since each state has additional requirements for architectural licensure and those requirements vary among the states, students are advised to review the requirements for architectural licensure of the state in which they intend to obtain their license. The National Council of Architectural Registration Boards (NCARB) website at <https://www.ncarb.org/> and individual state architectural licensing board websites are good resources for researching additional architectural licensure requirements by state.

## School of Music, Teacher Education Certification

Carnegie Mellon has determined that the Carnegie Mellon K-12 Music Education Certification program meets the *educational requirements* for educator licensure for instrumental, vocal, and general music (K-12) in the public schools of Pennsylvania, but has not determined whether it meets the educational requirements for educator licensure in other states or the District of Columbia. Students should also be aware that each state also has additional educator licensure requirements and those requirements vary among the states. Students are advised to review the requirements for educator licensure of the state in which they intend to obtain their license prior to starting the academic program. Individual state educator licensing board websites are good resources for researching additional educator licensure requirements by state.

Pennsylvania also participates as a reciprocating state (see <https://www.ecs.org/teacher-license-reciprocity-state-profiles/>) which allows for educators holding an educator's license in one state to earn a license in another state, subject to meeting specific state specific requirements of the other state. Information about educator licensure in Pennsylvania may be found on the PA Department of Education Website at <https://www.education.pa.gov/Educators/Certification/Pages/default.aspx>.

## College of Engineering, Undergraduate Degree Programs

Carnegie Mellon's engineering programs (Mechanical Engineering, Civil and Environmental Engineering, Chemical Engineering, Materials Science and Engineering, and Electrical and Computer Engineering) are accredited by the Engineering Accreditation Commission of ABET (see <https://www.abet.org/>). In order to obtain professional engineer licensure in any state, students must graduate from an ABET-accredited program and meet testing and/or work experience requirements of the state in which they intend to obtain their license. Students are advised to review the requirements for professional engineer licensure of the state in which they intend to obtain their license. Information about professional engineer licensure in Pennsylvania may be found on the PA Department of State website at <https://www.dos.pa.gov/ProfessionalLicensing/BoardsCommissions/EngineersLandSurveyorsandGeologists/Pages/Engineer-Guide.aspx>.

The National Society of Professional Engineers website at <https://www.nspe.org/resources/licensure/licensing-boards> and individual state professional engineer licensing board websites are good resources for researching additional professional engineer licensure requirements by state.

## Section 6: Educational Programs

### [Undergraduate & Graduate Programs](#)

Carnegie Mellon offers dozens of programs including undergraduate and graduate offerings. A full list of our Schools and Colleges can be found here, <https://www.cmu.edu/academics/index.html>.

Carnegie Mellon offers a broad range of academic programs that are carefully designed, regularly assessed, and iteratively improved by the faculty in the responsible academic unit(s). Our students' educational experiences are aligned with the University's mission and goals and support our core values as well as our commitment to excellence. We strive to offer an inclusive educational environment where students are supported to grow and thrive while preparing for their professional and personal post-graduate pursuits. The Vice Provost for Education has the responsibility to coordinate efforts, in partnership with the academic deans and associate deans, to assure processes for the development, review, and continuous improvement of all academic programs are in place and regularly conducted at the department, college and university levels. The Vice Provost for Education may be contacted at: [vpe@andrew.cmu.edu](mailto:vpe@andrew.cmu.edu).

In addition to the link above, please visit our specific undergraduate and graduate websites:

Undergraduate Programs, <https://www.cmu.edu/admission/majors-programs>

Graduate Programs, <https://www.cmu.edu/graduate/academics/guide-to-graduate-degrees-and-programs/index.html>

## Section 7: Study Abroad

A student's enrollment in a program of study abroad approved for credit by Carnegie Mellon may be considered enrollment at CMU for purpose of applying for assistance under Title IV of the Higher Education Act (HEA) as amended. For more information about study abroad and Coronavirus FAQs, please visit our website, <https://www.cmu.edu/oie/news-and-events/archives/2020-2021/covid/sab-and-coronavirus-faq.html>.

## Section 8: CMU Faculty and Instructional Facilities

Information about faculty and instructional facilities may be found on individual college/school websites via our website, <https://www.cmu.edu/academics/>.

## Section 9: Articulation Agreements

Cross-College and University Registration PCHE (Pittsburgh Council on Higher Education) Guidelines: Full-time Carnegie Mellon students may take courses for credit through the [Pittsburgh Council on Higher Education \(PCHE\)](#). This county-wide consortium of ten accredited member institutions permits the flow of students between institutions based on established protocols and agreements. Questions about Carnegie Mellon University's participation in PCHE may be directed to the University Registrar's Office at [uro-pche@andrew.cmu.edu](mailto:uro-pche@andrew.cmu.edu).

## Section 10: Written Arrangements

The Written Arrangements document on <https://www.cmu.edu/hub/consumer-information/docs/written-arrangement.pdf> provides information regarding written arrangements between Carnegie Mellon University (CMU) and any institution(s) that provides a portion of a CMU degree program to students enrolled at CMU. CMU enters into such agreements to enrich the educational experiences offered to its students.

## Section 11: Student Location Determination

Under the code of federal regulations (CFR) 600.9(c)(2)(iii) regarding state authorization requirements, an educational institution must make a determination regarding the state in which a student is located at the time of the student's initial enrollment in an educational program and, if applicable, upon formal receipt of information from the student, in accordance with the institution's procedures, that the student's location has changed to another state. Students are expected to review and update their off-campus residence and their permanent address in Student Information Online (SIO) at the beginning of each academic year and when they change their local and/or permanent addresses. For purposes of state authorization requirements, student location will be determined based on information in the Carnegie Mellon Student Information System (S3) in the following order:

1. Student's academic program code and;
2. Student's campus address, or;
3. Student's off-campus residence (if #1 and #2 cannot ascertain location) or;
4. Student's permanent address (if #1, #2, and #3 cannot ascertain location).

## Section 12: Computing Services

Information about Computing Services provides technology services as part of the Division of Operations. The Computing Services central IT department provides services that have strategic impact on university goals and may be accessed on our website, <https://www.cmu.edu/computing/>.

### Carnegie Mellon Computing Policy

Carnegie Mellon computing and related policies are available on our website: <https://www.cmu.edu/policies/information-technology/computing.html>

## Section 13: Information Security Office (ISO)

The Information Security Office is responsible for coordinating compliance with state, federal and international laws and regulations dealing with the security of Carnegie Mellon's information resources. This includes partnering with the Office of General Counsel and impacted business units to implement appropriate policies, procedures and controls to maintain compliance with legal requirements. More information is available on the ISO website, <https://www.cmu.edu/iso/compliance/index.html>.

## Section 14: Copyright

### Digital Copyright and DMCA

Carnegie Mellon University takes copyright violation seriously. Besides raising awareness about copyright law, it takes appropriate action in support of enforcement as required by policy and law. United States [copyright law](https://www.copyright.gov/) (see <https://www.copyright.gov/>) "protects the original works of authorship fixed in any tangible medium of expression, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device".

### Fair Use Policy

The University's Fair Use Policy states that all members of the University must comply with US copyright law and it explains the fair use standards for using and duplicating copyrighted material. In addition, the policy prohibits the duplication of software for multiple uses, meeting the Digital Millennium Copyright Act (DMCA) (see <https://www.copyright.gov/legislation/dmca.pdf>) requirements. The DMCA criminalizes the development or use of software that enables users to access material that is copyright protected. Furthermore, the Carnegie Mellon University Computing Policy (see <https://www.cmu.edu/policies/information-technology/computing.html>) prohibits the distribution of copyright protected material via the University network or computer systems, unless the copyright owner grants permission.

### Peer to Peer File Sharing

The Higher Education Opportunity Act of 2008 (Public Law 110-315) Section 488, requires institutions of higher education to annually inform students that "unauthorized distribution of copyrighted material, including unauthorized peer-to-peer file sharing,

may subject the students to civil and criminal liabilities". Carnegie Mellon University does this by publication of a news article on Computing Services' website or via mass mail communication each semester. The law goes on to require institutions "to provide a summary of penalties for violation of Federal copyright laws, including disciplinary actions that are taken against students who engage in unauthorized distribution of copyrighted materials using the institution's information system." Copyright protected materials can include, but are not necessarily limited to:

- Music
- Movies or other videos
- Literary works
- Software
- Digital images or libraries

### Penalties and Legal Actions

A user in violation of copyright law may face the following penalties:

- Suspension from the university network as described under The University Processing of a DMCA Notice.
- Prosecution in criminal court or a civil lawsuit seeking damages. Civil liability for copyright infringement can be as high as \$150,000 per instance of infringement in addition to legal fees. Criminal penalties for a first offense may be as high as five years in jail and a fine of \$500,000.
- Disciplinary action taken by the Human Resources, the Office of General Counsel, or the Office of Community Standards and Integrity depending on the specific affiliation of the alleged infringer.

### Additional Information

Additional Information may be found on the following CMU web pages:

<https://library.cmu.edu/services/copyright>

<https://www.cmu.edu/c-cm/>

<https://www.cmu.edu/computing/>

## Section 15: Student Activities

### Student Affairs

In depth information about CMU Student Affairs, including student activities and organizations, service and civic engagement, student government, diversity and inclusion, and how to get involved on campus is available on the CMU website, <https://www.cmu.edu/student-affairs/get-involved/index.html>.



## SLICE

The office of Student Leadership, Involvement and Civic Engagement (SLICE) website at <https://www.cmu.edu/student-affairs/slice/index.html> provides opportunities where undergraduate and graduate students can explore, connect and engage with one another to create a set of experiences that match their unique interests and talents.

## The Center for Diversity and Inclusion

Diversity and inclusion have a singular place among the values of Carnegie Mellon University.

The Center for Student Diversity and Inclusion (CSDI) actively cultivates a strong, diverse and inclusive community capable of living out these values and advancing research, creativity, learning and development that changes the world.

The Center offers resources to enhance an inclusive and transformative student experience in dimensions such as access, success, campus climate and intergroup dialogue. Additionally, the Center supports and connects historically underrepresented students and those who are first in their family to attend college in a setting where students' differences and talents are appreciated and reinforced.

More information is available on the CMU website at <https://www.cmu.edu/student-diversity/>.

## Section 16: Cost of Attending the University

Information about tuition and fees as well as estimated costs for books, course materials, supplies, and equipment; housing and food; transportation; and personal/miscellaneous expenses are available on the Student Financial Services' website at <https://www.cmu.edu/sfs/tuition/index.html>.

## Section 17: Net Price Calculator

The Net Price Calculator is a tool that is intended for U.S. citizens, eligible non-citizens and permanent residents who plan on pursuing a full-time undergraduate degree but haven't yet applied to the university. This tool is a great way to start a conversation with your family about affordability as you conduct your college search. Carnegie Mellon offers the Net Price Calculator in partnership with the College Board to enable prospective students and their families to estimate financial aid eligibility. Before using the calculator, watch our Net Price Calculator tutorial video below for helpful tips. The video as well as other helpful information, are available on our website, <https://www.cmu.edu/admission/aid-affordability/net-price-calculator>.

## Section 18: College Navigator

The College Navigator website is a free consumer information tool designed to help students, parents, and others get information about thousands of U.S. postsecondary institutions--including Carnegie Mellon University--in the Department of Education's National Center for Education Statistics (NCES). College Navigator includes information on graduation and retention rates, academic programs, costs, financial aid, student loan defaults, etc. The College Navigator website is <https://nces.ed.gov/collegenavigator/>.

## Section 19: Facilities & Services for Disabled Students

The Office of Disability Resources provides responsive and reasonable accommodations to students who self-identify as having a disability, including physical, sensory, cognitive and emotional disabilities. Students who want to learn more about the services and accommodations provided by the Office of Disability Resources, may visit <https://www.cmu.edu/disability-resources/students/>. Students may discuss accommodation needs by emailing [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) or calling 412-268-6121 to set up an appointment.

Students are also welcome to discuss concerns about support for disabilities with members of the admission staff, housing office and/or health/psychological services. Upon enrollment, students with disabilities should contact the Office of Disability Resources to discuss their needs and to develop a Student Individual Accommodation Plan. Accommodations are made with the intent to maintain the academic integrity of each course and the academic program as a whole, while also meeting assessed needs.

## Section 20: Student Privacy & FERPA

One of the most significant changes a parent or guardian experiences in sending a student to college is the difference in privacy standards for educational records. Carnegie Mellon values the student's right to privacy. The university adheres to a federal law called the Family Educational Rights and Privacy Act (also called FERPA or the Buckley Amendment) that sets privacy standards for student educational records and requires institutions to publish a compliance statement, including a statement of related institutional policies. For more detailed information, view the student privacy section of our website at <https://www.cmu.edu/hub/privacy/>

## Section 21: Student Information and Outcomes

### The Office of Institutional Analysis and Research (IRandA)

The Office of Institutional Analysis operates under the leadership of the Office of the Vice Provost for Institutional Effectiveness and Planning (see <https://www.cmu.edu/iep-office/index.html>) provides the CMU community with official information for use in external reporting and access to specific university datasets for internal analysis. More

information about IRandA is available on our website,  
<https://www.cmu.edu/ira/index.html>.

### Retention and Graduation Rates

Retention and graduation rates are available on the CMU website,  
[https://www.cmu.edu/ira/degrees-granted/graduation-and-retention-rates-by-cohort\\_11.4.2021.pdf](https://www.cmu.edu/ira/degrees-granted/graduation-and-retention-rates-by-cohort_11.4.2021.pdf) (scroll to bottom).

### Enrollment Counts

CMU Enrollment Counts are available on the CMU website,  
<https://www.cmu.edu/ira/Enrollment/index.html>.

### Integrated Postsecondary Education Data System (IPEDS)

IPEDS gathers information required under the Higher Education Act of 1965 as amended from colleges and institutions who participate in the federal student financial aid programs. This information includes

Information for Carnegie Mellon is available on the IPEDS website:

Category	Website
General Information	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#general">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#general</a>
Tuition, Fees & Estimated Student Expenses	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#expenses">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#expenses</a>
Financial Aid	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#finaid">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#finaid</a>
Net Price	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#netprc">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#netprc</a>
Enrollment	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#enrolmt">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#enrolmt</a>
Admissions	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#admsns">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#admsns</a>
Retention & Graduation Rates	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#retgrad">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#retgrad</a>

Outcome Measures	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#outcome">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#outcome</a>
Programs/Majors	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#programs">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#programs</a>
Service Members & Veterans	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#service">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#service</a>
Varsity Athletic Teams	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#sports">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#sports</a>
Accreditation	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#accred">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#accred</a>
Campus Security and Safety	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#crime">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#crime</a>
Cohort Default Rates	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#fedloans">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#fedloans</a>

### Common Data Set

The most recent information about Carnegie Mellon's common data set is available through our website, [https://www.cmu.edu/ira/CDS/cds\\_2122.html](https://www.cmu.edu/ira/CDS/cds_2122.html). Common data set includes:

[General Information](#)

[Enrollment and Persistence \(.pdf\)](#)

[First-Time, First-Year \(Freshman\) Admission \(.pdf\)](#)

[Transfer Admission \(.pdf\)](#)

[Academic Offerings and Policies \(.pdf\)](#)

[Student Life \(.pdf\)](#)

[Annual Expenses \(.pdf\)](#)

[Financial Aid \(.pdf\)](#)

[Instructional Faculty and Class Size \(.pdf\)](#)

[Degrees Conferred \(.pdf\)](#)

## Section 22: Career & Job Placement

### Career & Job Placement Service

The Career and Professional Development Center (CPDC) is Carnegie Mellon University's centralized career services center providing a comprehensive range of services, programs and materials focusing on career exploration and decision making, professional development, experiential learning and employment assistance to meet

today's evolving workplace and student goals of finding satisfying work! Information about the resources provided by CPDC is available on the CMU website, <https://www.cmu.edu/career/resource-library/index.html>.

### First Destination Career Outcomes

The Career and Professional Development Center (CPDC) surveys all students graduating from Carnegie Mellon University (excluding Heinz College and Tepper graduate students) in order to obtain information on their career plans after graduation, also known as **First Destination** Career Outcomes. Common points of data gathered from graduates include hiring companies, graduate and professional schools, starting salaries, and geographic locations. More information may be found on the CMU website, <https://www.cmu.edu/career/outcomes/post-grad-dashboard.html>.

## Section 23: Health and Safety

### Annual Security and Fire Safety Report

A copy of the most recent CMU Annual Security and Fire Safety Report is available on the CMU website at <https://www.cmu.edu/police/reporting-policy-training/2022asr.pdf>. Please see page 14 for Emergency Response and Evacuation Procedures. A printed copy of the report may be requested by contacting University Police at 412-268-6232 or [campuspd@andrew.cmu.edu](mailto:campuspd@andrew.cmu.edu).

Historical annual security and fire safety reports (Carnegie Mellon University Police Department Annual Reports) are also available online at <http://www.cmu.edu/police/annualreports/>.

### Alcohol and Drug Policy (Faculty, Staff, Students)

The University's Alcohol and Drug Policy, which includes information about health risks associated with drug and alcohol as well as resources for individuals who are experiencing substance use difficulties, is published on <https://www.cmu.edu/student-affairs/pdfs/2022-2023-alcohol-and-drug-guide-cmu.pdf>. The policy focuses on compliance with laws in the United States and the Commonwealth of Pennsylvania. However, as a global university with operations throughout the world, Carnegie Mellon is equally committed to compliance with all applicable alcohol and drug laws in all jurisdictions in which the university operates.

### Vaccination Policies

The university values personal and community health and recognizes the critical role that each individual plays in contributing to community health by participating in personal health care practices that prevent the spread of contagious diseases.

Participation in a vaccination program represents one such highly effective personal health practice. CMU Prematriculation Immunization Policy is published on <http://www.cmu.edu/policies/student-and-student-life/immunizations.html>.

COVID vaccine requirements change frequently. The most up-to-date information on COVID vaccination requirements is published on <https://www.cmu.edu/coronavirus/health-and-wellness/vaccines.html> and <https://www.cmu.edu/coronavirus/>. Immunization requirements for incoming students are published on <https://www.cmu.edu/health-services/new-students/>.

### Emergency Response Plan

The purpose of the Emergency Response Plan is to establish an organizational structure and procedures for response to major emergencies. It assigns the roles and responsibilities for the implementation of the plan during an emergency following the incident command system model. This plan has been prepared to address all types of emergencies affecting the Carnegie Mellon community in a coordinated and systematic manner. Carnegie Mellon University is committed to supporting the welfare of its students, faculty, staff and visitors. This plan is designed to maximize human safety and preservation of property, minimize danger, restore normal operations of the university, and assure responsive communication to all appropriate parties. See <https://www.cmu.edu/student-affairs/theword/community-policies/emergency-response-plan.html#scope> for more information.

## Section 24: Equity in Athletics

The Equity in Athletics Disclosure Act requires co-educational institutions of postsecondary education that participate in a Title IV, federal student financial assistance program, and have an intercollegiate athletic program, to prepare an annual report to the Department of Education on athletic participation, staffing, and revenues and expenses, by men's and women's teams.

### Statute and Regulations

The Higher Education Opportunity Act (Public Law 110-315) (HEOA) was enacted on August 14, 2008. This law reauthorizes and extends the Higher Education Act of 1965, as amended. The Higher Education Act (HEA) provides the statutory authority for most of the programs and activities administered or conducted by the Office of Postsecondary Education, including requirements related to equity in athletics disclosure.

### Annual Report

This information is available each November 1 at the U.S. Department of Education's website <https://ope.ed.gov/athletics/#>. To view the data, please select "Get data for one institution" (usually located on the right side of the page), enter "Carnegie Mellon University" in the "Name of Institution" field, and select the "Search" button at the bottom of the page. Select "Carnegie Mellon University" to view the institution's data.

A printed copy of the university's most recent report is available upon request by calling

the Department of Athletics, Physical Education and Recreation at 412-268-8054 or by sending an email to [jcentor@andrew.cmu.edu](mailto:jcentor@andrew.cmu.edu).

## Section 25: Textbook Information

### Bookstore

Required and recommended textbooks and supplemental course materials are available to purchase from the University Stores. Students can view and purchase their course materials by visiting the online bookstore at [https://bncvirtual.com/vb\\_home.php?FVCUSNO=37983&url=CarnegieMellon.htm](https://bncvirtual.com/vb_home.php?FVCUSNO=37983&url=CarnegieMellon.htm). To get started, students can visit the Textbooks FAQ at <https://bookstore.web.cmu.edu/SiteText?id=73594> for instructions on using the online bookstore site. The University Stores staff is happy to help with questions and can be reached by email at [books@andrew.cmu.edu](mailto:books@andrew.cmu.edu), by phone at 412-268-5591, or in-store.

### Textbook Provisions (Higher Education Opportunity Act 2008)

The Higher Education Opportunities Act (HEOA) of 2008 (see <https://www.congress.gov/bill/110th-congress/house-bill/4137>) outlines several provisions for publishers and higher education institutions related to textbooks and other course materials. According to the law, the language addressing textbooks is meant to “ensure that students have access to affordable course materials by decreasing costs to students and enhancing transparency and disclosure with respect to the selection, purchase, sale, and use of course materials (Sec. 133 a.)”

Textbook consumer information requirements are provided on <https://www.cmu.edu/es/course-and-classroom/textbooks.html>.

## Section 26: Voter Registration

### Pennsylvania

- **Pennsylvania Voter Registration** (see <https://www.pavoterservices.pa.gov/Pages/VoterRegistrationApplication.aspx>)
- **Find Your PA Polling Place** (see <https://www.pavoterservices.pa.gov/pages/pollingplaceinfo.aspx>)

### California

- **California Online Voter Registration** (see <https://registertovote.ca.gov/>)
- **Find Your CA Polling Place** (see <https://www.sos.ca.gov/elections/polling-place>)

### New York

- **New York Online Voter Registration** (see <https://www.elections.ny.gov/VotingRegister.html>)

- **Find Your NY Polling Place** (see <https://voterlookup.elections.ny.gov/>)

#### District of Columbia

- **Washington DC Voter Registration** (see <https://vote.gov/register/dc/>)
- **Find Your DC Polling Place** (see <https://www.dcboe.org/Voters/Where-to-Vote/Find-Out-Where-to-Vote> )

## Section 27: Tuition Adjustments/Withdrawals from the University

### Tuition Adjustments

If a student takes a leave of absence or withdraws within the first ten class days (fifteen calendar days) of a semester, tuition and fees are fully refundable, as indicated on the tuition adjustment schedule (see <https://www.cmu.edu/sfs/tuition/adjustment/index.html>). Students who take a leave of absence or withdraw from the university before completing 60% of the semester will be assessed tuition based on the number of days completed within the semester. This includes calendar days, class and non-class days, from the first day of classes to the last day of final exams. Breaks that last five days or longer, including the preceding and subsequent weekends, are not counted. Thanksgiving and Spring Break are not counted. There is no tuition adjustment after 60% of the semester is completed.

### Official Date of Leave of Absence/Withdrawal

For students who notify the university of their intent to take a leave of absence or withdraw, the official date is the earliest of the:

- Date the student began the withdrawal or leave of absence process;
- Date the student notified his or her home department;
- Date the student notified the associate dean of his or her college; or
- Date the student notified the dean of students.

For students who do not notify the University of their intent to take a leave of absence or withdraw, the official date is:

- The midpoint of the semester;
- The last date the student attended an academic-related activity, such as an exam, tutorial or study group, or the last day a student turned in a class assignment.

Other important information about tuition adjustments & withdrawals from the University as well as tuition adjustment schedules may be found on the following website: <https://www.cmu.edu/sfs/tuition/adjustment/index.html>.



### Tepper Refund Policy Exception:

Tepper School graduate tuition is refunded 100% to students who withdraw by the course drop deadline. After the course drop deadline, tuition is non-refundable and remains charged at 100%. This tuition refund policy is separate from the calculation used to cancel and return federal loan funds when students withdraw.

## Section 28: Transfer of Credit Policy

The University's Transfer of Credit Policy is published on <https://www.cmu.edu/policies/student-and-student-life/transfer-credit-evaluation-and-assignment.html>.

Transfer credit is only accepted for courses taken at accredited institutions from which an official transcript is received. Transfer credits must meet the academic requirements of the program in which the student is enrolled and may not exceed the maximum number of transferrable units, per the program's academic requirements. Courses accepted for credit must have been taken for a letter grade and students must have earned a C (2.00) or above in the transferred course, however, transfer credits will only record the units/credits earned, **not** the grade, unless the course is taken at one of the [Cross-Registration \(PCHE\)](#) affiliates. Carnegie Mellon does not award course credit for prior experience such as service in the armed forces, paid or unpaid employment, or other "real world" learning experiences or demonstrated competency. See additional information, <https://www.cmu.edu/hub/registrar/registration/transfer-transcripts.html>

Departmental transfer credit processes may vary. Please review information on your college or school of interest websites through <https://www.cmu.edu/academics>.

## Section 29: Contact Information for Assistance in Obtaining Institutional or Financial Aid Information

### Current Undergraduate Students:

Student Financial Aid Office

*Mailing Address:* Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213

*Telephone:* 412-268-8186

*Fax:* 412-268-8084

*Email:* [thehub@andrew.cmu.edu](mailto:thehub@andrew.cmu.edu)

*Website:* <https://www.cmu.edu/sfs/financial-aid/undergraduate/index.html>

### Prospective Undergraduate Students:

Student Financial Aid Office

*Mailing Address:* Office of Undergraduate Admission, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213

*Telephone:* 412-268-2082

*Fax:* 412-268-7838

*Email:* [admission@andrew.cmu.edu](mailto:admission@andrew.cmu.edu)

Website: <https://www.cmu.edu/admission/aid-affordability>

### Current and Prospective Graduate Students:

Student Financial Aid Office

*Mailing Address:* Carnegie Mellon University, Student Financial Aid Office, 5000 Forbes Avenue, Pittsburgh, PA 15213

*Telephone:* 412-268-8186

*Fax:* 412-268-8084

*Email:* [thehub@andrew.cmu.edu](mailto:thehub@andrew.cmu.edu)

*Website:* <https://www.cmu.edu/sfs/financial-aid/graduate/index.html>

## Section 30: Types of Financial Aid

There are various types of financial aid available for Carnegie Mellon students, including federal, state, and institutional. Understanding financial aid eligibility and the financial aid award letter will help students and families navigate financing decisions that need to be made while attending Carnegie Mellon. Visit our website at <https://www.cmu.edu/sfs/financial-aid/your-award/index.html> for help in understanding your financial aid awards.

### Undergraduate Grants

Grant assistance is awarded on the basis of demonstrated financial need. Students do not need to work for or repay grants. Grants are commonly referred to as "gift aid."

More information may be found on our website, <https://www.cmu.edu/sfs/financial-aid/types/scholarships-and-grants/grants.html>.

### Federal Pell Grant

A **Federal Pell Grant** is awarded by the federal government to students with high financial need. Students who are eligible for a Federal Pell Grant after their aid package is determined, will notice a dollar-for-dollar reduction to their Carnegie Mellon need-based grant funds. More information can be found on the Department of Education website, <https://studentaid.gov/understand-aid/types/grants/pell>.

### Federal Supplemental Educational Opportunity Grant

A **Federal Supplemental Educational Opportunity Grant (FSEOG)** is for undergraduate students who have exceptional financial need. Carnegie Mellon usually awards these grants to students who receive a Federal Pell Grant. If there is a change in Federal SEOG eligibility, a dollar-for-dollar adjustment to the student's Carnegie Mellon need-based grant funds will occur. More information can be found on the Department of Education website, <https://studentaid.gov/understand-aid/types/grants/fseog>.

## State Grants

Some states, including the state of Pennsylvania, provide educational grants to their residents who demonstrate need. View a list of participating states on <https://www.cmu.edu/sfs/financial-aid/types/scholarships-and-grants/state-grants.pdf>.

Upon notification from any state agency of a student's eligibility, Carnegie Mellon will modify the student's financial aid package to reduce Carnegie Mellon need-based grant funds dollar-for-dollar.

See the National Association of Student Financial Aid Administrators (NASFAA) website, [https://www.nasfaa.org/State\\_Financial\\_Aid\\_Programs](https://www.nasfaa.org/State_Financial_Aid_Programs), for more information on state grants.

## Graduate Scholarships, Grants, Stipends, Assistantships, Fellowships

Funding for graduate students may include scholarships, grants, stipends, assistantships, and fellowships. For information about these awards, contact the academic department you plan to attend. The department will be able to discuss the amounts and requirements for each type of funding.

## Student Employment

There are three types of hourly student employment options available:

- Federal Work-Study (FWS): Funding = 40% Federal / 60% Employer
- Federal Community Service Work-Study (FCS): Funding = 70% Federal / 30% Employer
- **Non-Work-Study (NWS):** Funding = 100% Employer

Federal Work-Study (FWS) is a need-based self-help award. If a student has been awarded FWS, the FWS award is the total that can be earned during the academic year as a work-study student. It is important to note that funds earned in the Federal Work-Study Program (including the Federal Community Service Work Study Program) are not credited to the student's account.

Students who do not have financial need or who have not applied for financial aid may find non-work-study job opportunities on campus.

More information about student employment is available on the following website:

- *FAQs:* <https://www.cmu.edu/sfs/student-employment/faq.html>
- *On Campus Employment for Students:* <https://www.cmu.edu/career/students-and-alumni/on-campus-employment/index.html>
- *Student Hourly Positions:* <https://www.cmu.edu/sfs/student-employment/hourly-positions.html>

## Loans

Several types of loans are available to students who meet eligibility requirements. Information about federal, institutional, and private loans is available on <https://www.cmu.edu/sfs/financial-aid/types/index.html>. The site includes detailed information about loan terms and how to apply.

Note that the following disclosure is required for Carnegie Mellon students enrolled in California: If a student obtains a loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund (amount returned to the loan program, if any). If the student has received federal student financial aid funds, the student is entitled to a refund of the moneys not paid from federal student financial aid program funds. Learn more about student account refunds on our website, <https://www.cmu.edu/sfs/billing/refunds.html>.

### Federal Direct Student Loans

Federal Direct Student Loans are the most widely-used loan for college students. Eligibility is determined by completing the FAFSA. Types of Federal Direct Loans include Federal Direct subsidized, unsubsidized, and Plus (for parents or graduate students). Detailed information about Federal Direct Student Loans is available on our website, <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/index.html>.

### Federal Loan Repayment

Federal student loans offer flexible repayment plans, loan consolidation, forgiveness programs, and more. View more information on [loan repayment options](https://studentaid.gov/) on <https://studentaid.gov/>, where you can find comprehensive information about your federal loans, including your loan amounts and balances, your loan servicer and contact information, your interest rates, your current loan status, guidance on loan repayment options, etc.

Repayment plans determine your monthly student loan payment amount, how many years it will take to pay back what you borrowed, and how much interest you will pay over the life of your loan. Keep in mind, the longer it takes to pay back your loan, the more interest will accrue and increase the overall cost of your loan. *Note that any private loans you have borrowed do not appear on studentaid.gov.*

### Federal Student Loan Entrance Counseling\*

All first-time Federal Direct Loan borrowers are required complete an online entrance counseling session after receipt of the financial aid award letter. The session provides information about borrower rights and responsibilities. CMU is notified when a student has completed entrance counseling. Students who have completed a federal entrance counseling session while at CMU, do not have to complete another one. You may view instructions on <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/mpn-entrance-counseling.html>.

## Student Rights and Responsibilities/Master Promissory Note (MPN)\*

All first-time Direct Loan borrowers are required to complete a Master Promissory Note (MPN). The MPN is a legal document in which you promise to repay your loan(s) and any accrued interest and fees to the U.S. Department of Education. It also explains the terms and conditions of your loan(s) and sample loan repayments. All student borrowers must read and understand their rights and responsibilities when choosing to borrow a federal loan. The MPN is available on the U.S. Department of Education website, <https://studentaid.gov/mpn/>.

\*Loan funds will not disburse until both Entrance Counseling and the MPN are completed.

## Federal Loan Exit Counseling

Upon ceasing enrollment and prior to beginning loan repayment federal loan borrowers are required to complete an online exit counseling session. Federal loan exit counseling provides important information you need to prepare to repay your federal student loans. Topics include understanding your loans, plans for repayment, avoiding default, and making finances a priority. Exit counseling may be completed on the U.S. Department of Education website, <https://studentaid.gov/exit-counseling/>. See also the *Direct Loan Exit Counseling Guide* on <https://studentaid.gov/sites/default/files/exit-counseling.pdf>.

## Yeknik Student Loan

The Yeknik Student Loan Fund is endowed by Wayne M. and Nancy Yeknik. It is an institutional loan awarded to students who are sophomores, juniors, and seniors, have a cumulative 3.0 QPA, and have financial need. More information is available on our website, <https://www.cmu.edu/sfs/financial-aid/types/yeknik.html>.

## Private Education Loans

Private loans are a borrowing option for some students. Carnegie Mellon recommends that you review your federal, state, and institutional grants and loan options to compare borrower benefits and loan terms before opting to borrow a private education loan because the terms and conditions of federal student loans may be more favorable than those of private education loans.

Carnegie Mellon University does not endorse any lender. Carnegie Mellon uses a loan comparison tool called FastChoice (see, <https://choice.fastproducts.org/FastChoice/home/324200>) that is offered free-of-charge to schools by the Great Lakes Higher Education Corporation. The lenders presented in FastChoice include lenders from whom our students have borrowed over the past two years and who have demonstrated a high level of service or other benefit to our students. This list is updated annually and is not-all inclusive. Students should understand that they may choose any lender they wish (even those not presented in Fast Choice) without penalty or unnecessary delays.

### Private Loan Self-Certification Form

Pursuant to Section 155 of the Higher Education Act of 1965, as amended, (HEA) and to satisfy the requirements of Section 128(e)(3) of the Truth in Lending Act, a lender must obtain a self-certification signed by the applicant before disbursing a private education loan. The school is required on request to provide this form or the required information only for students admitted or enrolled at the school. The Self Certification form is available through your lender and on our website at <https://www.cmu.edu/sfs/docs/private-loan-cert.pdf>. If the information needed to complete the form is not pre-filled on the form, you may access the information on your financial aid award letter from the school or by contacting the Student Financial Aid Office at [student-financial-aid@andrew.cmu.edu](mailto:student-financial-aid@andrew.cmu.edu).

### Lender Relationship Code of Conduct

Carnegie Mellon officials are prohibited from accepting any financial or other benefits in exchange for displaying lenders and loan options in FastChoice. Our lender relationship code of conduct is published on <https://www.cmu.edu/sfs/docs/loans-code-of-conduct.pdf>.

## Section 31: Financial Aid Disbursements

Financial aid (including student loans) is disbursed one semester at a time based on the student's enrollment at the time of each disbursement. The Student Financial Aid Office begins to disburse aid to student accounts approximately 10 days before classes begin for students who have completed the necessary requirements.

### Grants and Scholarships Disbursements

Grants and scholarships are determined by the Student Financial Aid Office and are applied directly to the student account on a semester basis to pay charges for tuition, fees and on-campus room and board (if applicable).

### Federal Loan Disbursements

First-time Federal Direct Loan borrowers are required to sign a Master Promissory Note and complete loan entrance counseling before loan funds are credited to the student account. After these loan requirements are completed (no sooner than 10 days prior to the start of the semester), federal loans are disbursed to the student account. Disbursements are made to the student account in two equal payments (unless the loan is for one semester) - one for each semester covered by the loan. It is very important to understand that before federal student loans disburse, loan proceeds are reduced by the federal origination fee (see, <https://studentaid.gov/understand-aid/types/loans/interest-rates#fees>) Upon disbursement, actual amounts may be viewed by logging into Student Information Online (SIO) on <https://www.cmu.edu/hub/sio/about.html> and selecting "Student Account Activity" from the "Finances" menu.

View loan disbursement dates here: <https://www.cmu.edu/sfs/financial-aid/index.html#disbursement>

### Private Loan Disbursements

Generally, private loan disbursements occur at the beginning of each semester covered by the loan. Students should review their loan disclosures from their lender in order to determine the actual anticipated disbursement dates for private loans. Actual disbursements amounts can be viewed after they occur by logging into Student Information Online (SIO) on <https://www.cmu.edu/hub/sio/about.html> and selecting “Student Account Activity” from the “Finances” menu.

### Federal Work-Study Disbursements

Students who are awarded Federal Work-Study may earn Federal Work-Study funds by working in positions with eligible employers. Wages are paid bi-weekly through the payroll system. **These funds are not disbursed directly to the student account.**

### Outside Scholarships Disbursements

Once the Student Financial Aid Office receives outside scholarship funds, they are credited to the student account and the student is notified if the outside scholarship reduces their eligibility for other financial aid. If the scholarship provider issues the funds by check, the student will be contacted to endorse the check prior to the funds being credited to their student account.

### Financial Aid/Student Account Refunds

When financial aid disburses, it is credited against the student account balance. If there is a credit balance remaining on the student account after all tuition and fees are paid, the student account is reviewed to determine if the student is eligible for a credit balance refund. If eligible, the refund is issued to the student either electronically (if you signed up for electronic refunding) or by paper check. View more information about refunds on our website, including electronic refund steps, on: <https://www.cmu.edu/sfs/billing/refunds.html>.

## Section 32: Satisfactory Academic Progress Policy & Procedural Statement

To be eligible for federal, state, and institutional financial aid, all students are required to maintain Satisfactory Academic Progress toward the completion of a degree. Each university determines its own policy in accordance with federal regulations set forth by the U. S. Department of Education regarding satisfactory progress standards to ensure student success. To maintain Satisfactory Academic Progress at Carnegie Mellon University, students must meet the following minimum standards for both of the qualitative (QPA) and quantitative (completion rate) measures:

<b>Student Type</b>	<b>QPA (Qualitative)</b>	<b>Completion Rate (Quantitative)*</b>
First Year Undergraduate	1.75	80%
Upperclass	2.00	80%
Graduate	3.00	80%

\*To calculate the completion rate, the cumulative number of completed units is divided by the cumulative number of units attempted. Advance Placement credits are excluded from both figures. In addition to the above-mentioned Financial Aid Satisfactory Academic Progress standards, federal regulations require a student to complete their degree within a specified amount of time. The maximum timeframe cannot exceed 150 percent of the time published as needed for completion of the program. Scope: This policy applies to Federal aid including Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Work-Study, Federal Direct Loans, and Federal Direct PLUS Loan programs; state grant aid; and Carnegie Mellon institutional aid including grants, loans, and scholarships.

Federal regulations can be found at: Federal Student Aid Handbook, Volume 1 Chapter 1 School Determined Requirements 34 CFR 668.16(e) 34 CFR 668.32(f) 34 CFR 668.34

### Evaluation:

Carnegie Mellon evaluates all students for Financial Aid Satisfactory Academic Progress annually, at the end of the spring semester. Students that are included in the review are undergraduates, graduates, both full-time and part-time. Courses that do not count toward a student's degree cannot be used to determine enrollment status for financial aid purposes. Carnegie Mellon will count transfer credit hours that are accepted toward a student's educational program as both attempted hours and completed hours. Advanced Placement Non-Degree and Non-Credit courses are not counted as units passed or attempted. When a course is repeated, all grades will be recorded on the official academic transcript and will be calculated in the student's QPA.

For financial aid eligibility, only one repeat per course is permitted in the determination of enrollment status for courses previously passed. If the student withdraws and is not assigned a W grade, then it will not be counted in the number of units attempted or completed. If the W grade is assigned, the units will be counted in the number of units attempted and will be counted as zero in the number of units completed. If the student has incomplete units, the units will be counted as attempted and will be counted as zero in the number of units completed.

The Financial Aid Satisfactory Academic Progress evaluation is a cumulative review of all semesters, regardless of whether or not the student received financial aid during the academic year. If the minimum requirements are not achieved, the student is ineligible to receive financial aid. In such a case, the student is notified and given an option to appeal their financial aid status. More information about the appeal process can be



found at [www.cmu.edu/sfs/financial-aid/policies/academic-progress.html](http://www.cmu.edu/sfs/financial-aid/policies/academic-progress.html). A financial aid package will not be completed unless an appeal is received, approved and processed accordingly. If by chance a financial aid package is processed and released to the student, it is conditional and subjected to financial aid removal until an appeal is received, approved and processed accordingly. Contact: Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412- 268-1353.

## Appeal Process

Carnegie Mellon realizes that extenuating circumstances may contribute to a student's inability to achieve Satisfactory Academic Progress. Once a student receives notification of their Financial Aid Satisfactory Academic Progress status and it is determined that they are not making progress, the student is encouraged to appeal the determination.

A letter of notification will be mailed to the student that will address the requirements for Satisfactory Academic Progress and define the student's specific academic progress to date. This letter will also address the appeal process and provide directions for filing the appeal.

A student may appeal a Financial Aid Satisfactory Academic Progress decision by writing a letter explaining the extenuating circumstances, defining information that prevented them from making academic progress and what has changed in their situation that would allow them to demonstrate satisfactory academic progress at the next evaluation. The next period of evaluation will be defined in the appeal notification and may be the next semester or combination of enrollment periods.

This letter should be attached to the Financial Aid Satisfactory Academic Progress Appeal Form and returned to The HUB, ATTN: Financial Aid Academic Progress. The student will be notified in writing of the appeal decision within two weeks of the receipt of the appeal.

### *Examples of Appeals:*

- Extended illness
- Changes in major
- Difficult transition to first-year in college (academically and socially)
- Recent diagnosis of learning disability
- Recent death of a close family member

If summer courses at Carnegie Mellon will enable the student to meet the minimum academic progress requirements, the student will regain financial aid eligibility. The student should submit an appeal or send an email to [thehub@andrew.cmu.edu](mailto:thehub@andrew.cmu.edu) indicating that they have now achieved Satisfactory Academic Progress due to summer course completion. If the student takes courses at another institution during the summer that will increase the number of units completed,

they will need to forward a copy of the official transcript to their HUB liaison with the copy clearly marked "ATTN: Financial Aid Academic Progress."

If there are missing grades for the spring semester, the student will need to have their instructor update the missing grades. Grades can be checked via Student Information Online (SIO) on our website, <https://www.cmu.edu/hub/sio/about.html>. When all missing grades have been updated, the student should email their HUB liaison to indicate that Satisfactory Academic Progress has been achieved due to the updating of missing grades.

If an appeal is approved for the fall semester only, then the fall semester is considered a probationary semester for financial aid eligibility. To be eligible for financial aid funds for the spring semester, the student is required to achieve a cumulative 2.0 QPA (3.0 for graduate students) and successfully pass a minimum of 80% of the accumulated units attempted/carried. Financial Aid Satisfactory Academic Progress evaluation and reinstatement of spring financial aid occurs shortly after the fall grade submission deadline.

Depending on the nature of the appeal, the appeals committee may require the student to develop an academic plan in consultation with their academic advisor, which may put the student on track to successful program completion. This will be determined on an individual student basis and depend on the length of the student's enrollment, class completion rate and earned grade point average. All subsequent or second appeals will require an academic plan.

If the student is required to develop an academic plan, their progress is reviewed at the end of each payment period according to the requirements specified in the plan. If the student is meeting the requirements of the academic plan, they are eligible to receive financial aid as long as they continue to meet those requirements.

If an appeal is denied, the student should make arrangements to meet with their HUB liaison and an Associate Director of Student Financial Aid to discuss funding options. If an appeal is not received, the student is not eligible to receive financial aid.

### Financial Aid Academic Progress Improvement Plan

Students who are unable to meet the minimum satisfactory academic requirements for Financial Aid Satisfactory Academic Progress may be required to design and submit a [Financial Aid Academic Progress Improvement Plan \(pdf\)](#) (see, <https://www.cmu.edu/sfs/docs/academic-plan.pdf>). The goal of the improvement plan is to ensure the student makes documented steady progress toward meeting our Financial Aid Satisfactory Academic Progress standards and graduates within the university's normal time frame to complete a degree. The need for the plan will be determined on an individual student basis and depend on the length of the student's enrollment, class completion rate and earned grade point average. All subsequent or second appeals will require an academic plan. View more details about the Financial Aid Academic Progress Improvement Plan on our website, <https://www.cmu.edu/sfs/financial-aid/policies/academic-plan.html>.

## Section 33: Federal Title IV Verification Policy and Procedural Statement

### Policy Reason

The U. S. Department of Education requires that Federal Title IV applicants provide documentation to verify the accuracy of the information submitted on the Free Application for Federal Student Aid (FAFSA) each year. Federal regulations include verification as part of the Federal Student Aid (FSA) program requirements, and it is required for applicants for most FSA programs with the exception of students receiving only a parent or graduate PLUS loan or an unsubsidized Stafford loan. Each university is required to have policies for verifying the reported information.

Federal regulations can be found at: Federal Student Aid Handbook Application & Verification Guide Chapter 4: Verification, Updates, and Corrections 34 CFR 668.51-61.

### Policy and Procedural Statement

Federal verification guidelines require that applicants are selected for verification by the Central Processing System (CPS) or by the school. At Carnegie Mellon, federal verification is performed on all applicants selected by the CPS and any application that the university has reason to believe is incorrect or has conflicting documentation.

Under certain circumstances a CPS selected application may be excluded from some or all of the federal verification requirements due to the following unusual circumstances including:

- death of the student,
- not an aid recipient,
- applicant is eligible to receive only unsubsidized student financial assistance,
- applicant verified by another school or post enrollment (the student was selected for verification after ceasing to be enrolled).

With the exception of the death of the student, however, none of these exemptions excuse the university from the requirement to resolve conflicting information.

Federal verification must typically be completed prior to the end of the academic year or before the student ceases enrollment, whichever occurs first. Students, who fail to comply with verification requirements, including submitting documentation within required timelines, will not have Federal Title IV funds disbursed and may have Federal Title IV funds cancelled. Carnegie Mellon considers the student to be the responsible party for providing information and completing the verification process.

Carnegie Mellon identifies the students selected for verification during the financial aid application process by viewing the FAFSA output document called the Institutional Student Information Record (ISIR). A review of the student's financial aid application occurs after ISIR data is received and data entry of required information is completed. The ISIR will provide information about the student and family including a calculated

Expected Family Contribution (EFC), document codes identifying specific information about the applicant data submitted, and written comments. The written messages provide additional information for the applicant to follow. The federal verification message for the student reads: "Your FAFSA has been selected for a review process called verification. Your school has the authority to request copies of certain financial documents from you and your parent(s)." The verification activity will initially compare applicant data for accuracy and completeness and continue to resolve conflicting information. In this process Carnegie Mellon requires verification of the following items:

For all applicants:

- Household size
- Number in college

For non-tax filers:

- Income earned from work

For tax filers:

- Adjusted Gross Income (AGI)
- U.S. income tax paid
- Income earned from work
- Education tax credits (American Opportunity Tax Credit and Lifetime Learning Tax Credit)
- Other untaxed income reported on tax return, for example: untaxed portions of Individual Retirement Account (IRA) distributions, untaxed portions of pensions, IRA deductions and payments, tax-exempt interest income

To complete the verification process acceptable documentation may include IRS Tax Transcripts, IRS Tax Forms (1040, 1040-SR, 1040-NR, and requested tax schedules), W-2's and the CSS/Financial Aid PROFILE. To resolve discrepancies in reported information students may be required to submit additional documentation.

Verification results that require changes to the applicant information and subsequent changes to the student's financial aid package will be made prior to final disbursement of federal funds. For all students eligible for subsidized Title IV aid the university will make appropriate changes to the student information electronically through the Department of Education's CPS to ensure each student has a correct valid ISIR. The student will be notified of this adjustment through a revised financial aid award letter.

If the verification results do not justify aid already disbursed, the student is responsible for repaying all aid for which they are not eligible. Failure to meet the repayment obligation will result in the student being referred by Carnegie Mellon to the U.S. Department of Education.

Verification results that reveal possible fraud or criminal misconduct in connection with the financial aid application or verification processes will result in the matter being referred by Carnegie Mellon to the Office of the Inspector General of the U.S. Department of Education for investigation. In the event that individual circumstances and unusual situations are not addressed or defined through standard verification procedures, additional review is necessary. These cases must be sufficiently documented and may be processed in accordance with regulations as defined in Professional Judgment and Dependency Overrides Statute: HEA Sec.479A(a)(7) and Sec. 480 (d)(7).

### Federal Title IV Funds Disbursements

Carnegie Mellon completes federal verification for selected applicants as a requirement of completing a student's financial aid application. Federal Title IV funds will not be disbursed until federal verification is completed. In some instances the institution can make an interim disbursement of funds if it has no reason to believe that the application information is inaccurate. If the institution makes an interim disbursement, the verification process must be completed prior to the disbursement of any additional funds. In all instances the institution is liable for an interim disbursement if verification identifies an overpayment or the student fails to complete verification.

### Contact

Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412- 268-1353.

## Section 34: Return to Title IV Funds Policy and Procedural Statement (effective 7.1.2021)

### Policy Reason

The U. S. Department of Education requires that the university determine the amount of Federal Title IV aid earned by a student who withdraws or fails to complete the period of enrollment. The university *must determine the earned and unearned portions of Title IV aid as of the date the student ceased attendance* based on the amount of time the student has spent in attendance. Unless the student meets one of the exemptions below in items 1 – 4, up through the 60% point in the period of enrollment, a pro rata schedule is used to determine the amount of Title IV funds the student has earned at the time of withdrawal. After the 60% point in the period of enrollment a student has earned 100% of the Title IV funds they were scheduled to receive. For a student who withdraws after the 60% point-in time, there are no unearned funds.

Effective July 1, 2021, there are four ways in which a student enrolled in a program delivered in modules\*\* is exempt from the normal rules for return of Title IV funds (R2T4) mentioned above, and thus is not considered to be a withdrawal. Even though a student may meet one of the exemptions for R2T4, a student's cost of attendance and

financial aid may need to be reduced if the student does not attend all periods of enrollment for which Title IV aid has been determined. The 4 exemptions are:

1. If the student has completed all requirements for graduation within the payment period or period of enrollment;
2. If the student successfully completes Title IV-eligible coursework in one module or a combination of modules that equals 49% or more of the number of countable days\*\* in the payment period or period of enrollment; or
3. If the student successfully completes Title IV-eligible coursework equal to or greater than what the school considers to be half-time enrollment (18 units) for the payment period or period of enrollment.
4. If a student who has dropped all classes except for classes in a future module within the semester has provided written confirmation to the school of their intention to return within 45 days within the same semester. Pre-registration does not constitute written confirmation.

\*A student is considered to be enrolled in a program delivered in modules in any semester in which the student is enrolled in any class that does not span the entire semester.

\*\*Countable days for calculating the 49% exemption include the first day of classes up to and including the last day of classes in the student's individual enrollment period (semester or mini), including days between modules and excluding breaks of 5 or more days.

All courses for which the student is registered AND courses for which the student has begun attendance are considered when determining the 49% exemption, even those courses that have been dropped. Federal regulations can be found at: Federal Student Aid Handbook, Volume 5 Chapter 1 Withdrawals and the Return of Title IV Funds; 34 CFR 668.22

At Carnegie Mellon, Title IV funds are awarded to a student under the assumption that the student will attend school for the entire period for which the assistance is awarded. When a student withdraws, the student may no longer be eligible for the full amount of Title IV funds that the student was originally scheduled to receive.

If a recipient of Title IV grant or loan funds withdraws from a school after beginning attendance, the amount of Title IV grant or loan assistance earned by the student must be determined. Additionally, if a recipient of Title IV grant or loan funds who is enrolled in a program delivered in modules does not attend all scheduled modules or withdraws from a module, the school must determine whether the student is considered to be a Title IV withdrawal and must determine the amount of Title IV grant or loan assistance earned by the student. If the amount disbursed to the student is greater than the amount the student earned, the unearned funds must be returned. If the amount disbursed to the student is less than the amount the student earned, and for which the

student is otherwise eligible, the student is eligible to receive a Post-withdrawal disbursement of the earned aid that was not received.

Carnegie Mellon determines the Withdrawal Date and Date of Determination to complete the return of funds calculation. A student's withdrawal date and date of determination varies depending on the type of withdrawal. When a student provides official notification to Carnegie Mellon through the Student Leave of Absence and Withdrawal Process, the withdrawal is defined as an official withdrawal. When the student does not complete the Student Leave of Absence and Withdrawal Process and no official notification is provided by the student, it is considered an unofficial withdrawal.

### Leave of Absence/Withdrawal Process

A student may leave Carnegie Mellon by either taking an academic leave of absence (leaving the university temporarily with the firm and stated intention of returning) or by withdrawing from the university (leaving the university with no intention of returning). In accordance with the provisions of CFR 668.22, regardless of the reason for taking an academic leave of absence, both academic leaves and withdrawals at Carnegie Mellon University are considered withdrawals for Title IV purposes. That is, the student begins any applicable grace period for loan repayment as of the date of the academic leave or withdrawal, regardless of the reason for leaving school or the intention to return. Students choosing to take an academic leave of absence should first contact their academic advisor to discuss their plans while on leave and to work out any conditions that may be necessary for a smooth return to Carnegie Mellon. A student deciding to leave the university should take the following steps:

- Complete a Leave of Absence or Withdrawal Form.
- The form must include all necessary signatures or the process will not be completed.
- Return the completed form to the University Registrar's Office, 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213.

### Determination of Withdrawal Date

#### Official Withdrawals (Notification Provided by the Student)

Those withdrawals defined as official are processed in accordance with federal regulations. The Office of the Registrar provides information that identifies which students have processed a Student Leave of Absence and Withdrawal Form for each semester. This information includes the Date of Withdrawal, the Date of Determination, Withdrawal/Leave Status (LA, LS, & W2) and the semester of attendance. This information is maintained in the student's academic file and in the university's Student Information System. For students who notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is the earliest of:

- Date the student began the withdrawal or leave of absence process;
- Date the student notified his or her home department;

- Date the student notified the associate dean of his or her college; or
- Date the student notified the dean of students.

#### Unofficial Withdrawal (No Official Notification Provided by the Student)

For a student who withdraws without providing notification to Carnegie Mellon, the institution determines the withdrawal date using defined criteria. This category of withdrawals includes students that drop out and students that do not earn a passing grade.

To identify the unofficial withdrawals the Registrar develops a preliminary list of students that did not complete the semester by reviewing the final student grade reports. The list includes all students with:

- a) semester units carried,
- b) 0 semester units passed,
- c) 0 quality points earned, and
- d) 0.0 QPA.

The Registrar contacts the academic divisions about each student to determine if the student actually completed the semester and earned the grades (0.0) or failed to complete the semester and did not notify the university of their status. For students who do not notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is:

- The midpoint of the semester or;
- The last date the student attended an academically-related activity such as an exam, tutorial or study group, or the last day a student turned in a class assignment.

#### Date of Determination that the Student Withdrew

Carnegie Mellon is not required to take attendance and the Date of Determination that a student withdrew varies depending upon the type of withdrawal:

##### Official or Unofficial

1. For withdrawals where the student provided Official Notification the Date of Determination is:
  - a. The student's withdrawal date,
  - b. or the date of notification, whichever is later.
2. For withdrawals where the student did not provide Official Notification the Date of Determination is:
  - a. The date the institution becomes aware the student has ceased attendance.



b. For a student who withdraws without providing notification to the institution, the institution must determine the withdrawal date no later than 30 days after the end of the enrollment period.

### Calculation of Earned Title IV Assistance

The withdrawal date is used to determine the point in time that the student is considered to have withdrawn so the percentage of the period of enrollment completed by the student can be determined. The percentage of Title IV aid earned is equal to the percentage of the period of enrollment completed. Unless a student who is considered to have withdrawn meets one of the 4 exemptions listed above, the amount of Title IV federal aid earned by the student is determined on a pro-rata basis up to the end of 60% of the semester. For example, if the student completed 30% of a term, 30% of the aid originally scheduled to be received would have been earned. Once a student has completed more than 60% of a term, all awarded aid (100%) has been earned. The percentage of federal aid earned and the order in which the unearned aid is returned are defined by federal regulatory requirements.

The calculation of earned Title IV funds includes the following grant and loan funds if they were disbursed or could have been disbursed to the student for the period of enrollment for which the Return calculation is being performed:

- Pell Grant
- Iraq and Afghanistan Service Grant
- TEACH Grant (not available at Carnegie Mellon)
- FSEOG Grant
- Federal Direct Loan

### Institutional Charges

Institutional charges are used to determine the portion of unearned Title IV aid that the school is responsible for returning. Carnegie Mellon ensures that all charges for tuition, fees, living expenses, as well as all other applicable institutional charges are included in the return calculation. Institutional charges do not affect the amount of Title IV aid that a student earns when they withdraw. The institutional charges used in the calculation usually are the charges that were initially assessed the student for the period of enrollment. Initial charges are only adjusted by those changes the institution made prior to the student's withdrawal (for example, for a change in enrollment status unrelated to the withdrawal). If, after a student withdraws, the institution changes the amount of institutional charges it is assessing a student, or decides to eliminate all institutional charges, those changes affect neither the charges nor aid earned in the calculation.

### Return of Unearned Funds to Title IV

If the total amount of Title IV grant and/or loan assistance that was earned as of the withdrawal date is less than the amount that was disbursed to the student, the difference between the two amounts will be returned to the Title IV program(s) and no

further disbursements will be made. If a student has received excess funds, the College must return a portion of the excess equal to the lesser of the student's institutional charges multiplied by the unearned percentage of funds, or the entire amount of the excess funds. The funds will be returned in the order below as prescribed by federal regulations, within 45 days from the date of determination that a student withdrew.

- Unsubsidized Federal Stafford Loans
- Subsidized Federal Stafford Loans
- Federal PLUS loans
- Federal Pell Grants
- Federal Supplemental Educational Opportunity Grants (FSEOG)

### Post-Withdrawal Disbursements

If the total amounts of the Title IV grant and/or loan assistance earned as of the withdrawal date is more than the amount that was disbursed to the student, the difference between the two amounts will be treated as a post-withdrawal disbursement. In the event that there are outstanding charges on the student's account, Carnegie Mellon will credit the student's account for all or part of the amount of the post-withdrawal disbursement up to the amount of the allowable charges. Any amount of a post-withdrawal disbursement that is not credited to a student's account will be offered to the student within 30 days of the date that the institution determined that the student withdrew. Upon receipt of a timely response from the student, the College will disburse the funds within 90 days of the date of determination of the student's withdrawal date.

### Contact

Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412-268-1353.

## Section 35: Carnegie Mellon Ethics Hotline

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity relating to financial matters, academic and student life, human relations, health and campus safety or research. Students, faculty and staff can anonymously file a report by calling 877-700-7050 or visiting [www.reportit.net](http://www.reportit.net) (user name: tartans; password: plaid). All submissions will be reported to appropriate university personnel. The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.

## Section 36: Statement of Assurance

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the Office for Institutional Equity and Title IX, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-7125.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.



# **Integrated Innovation Institute Silicon Valley School Catalog 2024-25 Academic Year**

**August 26, 2024 – June 30, 2025**

## **Carnegie Mellon University**

Integrated Innovation Institute

311 S Craig St. 2<sup>nd</sup> Floor

Pittsburgh, PA 15213

1-844-629-0200

<https://www.cmu.edu/iii/degrees/>

## **Branch Campus: Carnegie Mellon University - Silicon Valley**

NASA AMES RESEARCH PARK, MS 23-11

Moffett Field, CA 94035

Phone: (650) 335-2886; Fax (650) 603-7032

[www.cmu.edu/silicon-valley/](http://www.cmu.edu/silicon-valley/)

Carnegie Mellon University is a private, non-profit institution, approved to operate in California by the California Bureau for Private Postsecondary Education. Approval to operate means compliance with state standards as set forth in the California Private Postsecondary Education Act of 2009.

Carnegie Mellon University is accredited through a voluntary, peer-review process coordinated by the Middle States Commission on Higher Education (MSCHE or Middle States). MSCHE is one of six regional accrediting agencies in the United States, each accrediting institutions of higher education within a specific geographic region. Middle States is recognized by the U.S. Department of Education. This recognition enables MSCHE's member institutions to establish eligibility to participate in federal financial aid programs (e.g., federal loans, grants, and work-study) administered by the U.S. Department of Education. Carnegie Mellon University has been accredited by Middle States since 1921. More information regarding accreditation standards and processes and to view the University's re-accreditation reports on the Middle States Accreditation website at: <http://www.cmu.edu/middlestates/>.

Approval to operate means compliance with state standards as set forth in the California Private Postsecondary Education Act of 2009.

Any questions a student may have regarding this catalog that have not been satisfactorily answered by the institution may be directed to the Bureau for Private Postsecondary Education at 1747 N. Market Blvd, Ste 225,

Sacramento, CA 95834, [www.bppe.ca.gov](http://www.bppe.ca.gov), toll-free telephone number (888) 370-7589 or by fax (916) 263-1897.

As a prospective student, you are encouraged to review this catalog prior to signing an enrollment agreement. You are also encouraged to review the School Performance Fact Sheet, which must be provided to you prior to signing an enrollment agreement.

A student or any member of the public may file a complaint about this institution with the Bureau for Private Postsecondary Education by calling (888) 370-7589 toll-free or by completing a complaint form, which can be obtained on the bureau’s internet website, at [www.bppe.ca.gov](http://www.bppe.ca.gov)

CIP Codes: US Department of Education regulations as of July 1, 2011, require the institution to identify programs by Classification of Instructional Programs (CIP) Code, with links to the US Department of Labor/Employment and Training Administration’s Occupational Information network. For more information for CIP codes please visit web site at [www.nces.ed.gov/ipeds/cipcode](http://www.nces.ed.gov/ipeds/cipcode).

SOC Codes: NACCAS accrediting agency policies as of July 1, 2011, require the institution to identify programs by Standard Occupational Classification (SOC) Codes. The SOC system is used by Federal statistical agencies to classify workers into occupational categories. . For more information regarding SOC codes please visit internet web site at [www. Bls.gov/SOC/](http://www.bls.gov/SOC/). Also visit at <http://www.onecenter.org/overview.html> regarding occupational title for course of study.

Program	CIP	SOC	
MSSM	14.0903	11-9041	Architectural and Engineering Managers
		15-1243	Database Architects
		15-1252	Software Developers
		15-1253	Software Quality Assurance Analysts and Testers
		25-1032	Engineering Teachers, Postsecondary

**Carnegie Mellon University – Mission Statement**

To create a transformative educational experience for students focused on deep disciplinary knowledge; problem-solving; leadership, communication and interpersonal skills; and personal health and well-being.

To cultivate a transformative university community committed to (a) attracting and retaining diverse, world-class talent; (b) creating a collaborative environment open to the free exchange of ideas, where research, creativity, innovation and

entrepreneurship can flourish; and (c) ensuring individuals can achieve their full potential.

To impact society in a transformative way - regionally, nationally and globally - by engaging with partners outside the traditional borders of the university campus.

## **Integrated Innovation Institute – Educational Program Objectives**

### **Master of Science in Software Management**

- Identify and develop opportunities for software product innovation in support of the needs of individuals, organizations, and society.
- Formulate and execute a software project management strategy to deliver high-quality products and services.
- Collaborate in a multidisciplinary team environment in the context of a software-intensive project.
- Communicate effectively with a variety of stakeholders through written, spoken and visual communication methods.

### **CLASS LOCATION**

Classes offered for the Master of Science in Software Management (MS-SM) program in California are held at:

Branch Campus:

Carnegie Mellon University - Silicon Valley  
NASA AMES RESEARCH PARK, MS 23-11  
Moffett Field, CA 94035  
Phone: (650) 335-2886; Fax (650) 603-7032  
[www.cmu.edu/silicon-valley/](http://www.cmu.edu/silicon-valley/)

### **CMU-SILICON VALLEY FACILITIES**

The Silicon Valley campus is located in the historic Shenandoah Plaza on the NASA Ames Research Park. We occupy Building 23: a 20,111 sq. ft. two-story historic building and is our administrative and teaching building. It houses our academic space: 5 classrooms, 31 faculty and staff offices, 6 conference rooms, 2 kitchen/break rooms, 1 cafe lounge, and 1 multi-function lounge & event space.

Student Lounges: There are several spaces for students in Silicon Valley to use. The main student lounges can be found in B23, downstairs Room 129, upstairs Room 227, & in B24, in CMIL (the Carnegie Mellon Innovations Lounge).

Printers: Printers are for use in Building 23 (B23) Room 123 and the hallway in B23 outside of 109/110. Instructions for adding printers and policies are posted next to each printer.

### **Library Resources**

Library and Resources CMU-SV does not operate a library on campus, but we do have specialized library resources available for students, faculty, and staff.

Resources include:

1. Interlibrary Loan
2. e-book developments
3. University Libraries Quick Links

Through the Interlibrary loan, students can request books, articles from journals and conferences, technical reports, or other materials to be sent to you. The materials may be from Carnegie Mellon libraries in the U.S. or other institutions worldwide. Electronic delivery for many articles is available. ILLiad is the system that our students use to request these items. What ILLiad can be used for:

- To request to borrow a book, a tech report, a thesis, copy of an article, etc.
- Check status of requests
- Edit requests
- Cancel requests
- Update your contact information or delivery preferences
- Request to renew an interlibrary loan

The ILLiad link can be found at <https://illiad.library.cmu.edu/illiad/illiad.dll>.

The first time you use the link you need to provide information about yourself. You only need to do this once. When completing the form, choose these options:

- For **Mailing Address**, state: **Silicon Valley campus**
- For **Delivery Location**, state: **E&S Library**

Ebook developments can be found on our website at <http://guides.library.cmu.edu/svc>.

See below for an example of ebook developments:

We're building quite a collection of digital resources of interest to the Silicon Valley Campus. An eye-opening list is below:

- [AccessEngineering](#)

This is a "reference tool for professionals, academics, and students that provides seamless access to the world's best-known, most-used collection of authoritative, regularly updated engineering reference information. *AccessEngineering* also comprises dynamic online features, such as instructional, faculty made videos, calculators, interactive tables and charts, as well as personalization tools allowing users to organize crucial project information as they work." *AccessEngineering* includes the well-known Schaum's Outline series of books.

- [Knovel](#)

A digital collection of science and engineering reference books. Carnegie Mellon Users Only (including Silicon Valley Campus). Our access to their new collection on Computer Hardware Engineering is now available! You'll also find the books listed in CAMEO - our online catalog.

- [Synthesis Digital Library of Engineering and Computer Science](#)

"The basic component of the library is a 50- to 100-page 'Lecture'; a self-contained electronic book that synthesizes an important research or development topic, authored by an expert contributor to the field." You'll also find the books listed in CAMEO - our online catalog.

- [Springer e-Books Collection for Computer Science](#)

Thousands of computer science e-books from the publisher

- [Springer e-Book Collection for Engineering](#)

Thousands of engineering e-books from the publisher

- [Springer e-Book Collection for Mathematics & Statistics](#)

Thousands of mathematics e-books from the publisher

- [Plus - General e-Book Collecting from Many Different Publishers](#)

Since we have students, staff, and faculty in Pittsburgh, Qatar, Africa, and Silicon Valley, we're making a concerted effort to collect whatever e-Books we can so that all of our community can use them. You'll find them in CAMEO - our online catalog!

University Quick Links can also be found on the website at <http://guides.library.cmu.edu/svc>.

Here are examples of some quick links below:

- [Articles & Databases](#)

Alphabetical and subject listings of our available databases.

- [Cybersecurity](#)

- [e-Journals A to Z List](#)

Our automated (partially) method of finding e-Journals that we have access to - even if buried in a full-text database.

- [ECE Library Guide](#)

Library research guide for Electrical & Computer Engineering

- [Off-Campus / Wireless Access](#)

EZ Proxy single sign on added as an option

- [University Libraries Home Page](#)



Our home page has links to the simple and advanced search functions for CAMEO - our online catalog.

For additional questions regarding library resources, please contact Matt Marsteller, Associate Dean for Faculty/Principal Librarian at [matthewm@andrew.cmu.edu](mailto:matthewm@andrew.cmu.edu) or by phone: 412-268-7212

### **OFFICIAL ACADEMIC CALENDAR**

The official academic calendar for Carnegie Mellon University can be viewed here: <https://www.cmu.edu/hub/calendar/index.html>

### **PROGRAMS OFFERED**

The Integrated Innovation Institute offers one degree in connection with the Carnegie Mellon University - Silicon Valley campus.

**Master of Science in Software Management:** teaches students how to create innovative software products and services, manage the resources to create them, and gain the business expertise that is required for a successful software enterprise. The curriculum is currently offered through two full-time tracks (12 months or 16 months) and a part-time option. This degree is offered completely from the Carnegie Mellon University - Silicon Valley campus.

For detailed outline of the requirements for completion for this program offered at the Integrated Innovation Institute, including a description of the instruction provided in each of the courses, the requirements for completion of each program, including required courses, any final tests or examinations, any required internships or externships, and the total number of credit hours, clock hours, or other increments required for completion can be found online at:

### **Master of Science in Software Management**

- Overview – Full & Part Time Programs: <https://www.cmu.edu/iii/degrees/mssm/index.html>
- Curriculum: <https://www.cmu.edu/iii/degrees/mssm/curriculum.html>
- Example Job Classifications for Graduates: [https://www.cmu.edu/iii/degrees/admissions/bppe/mssm\\_jobclassification.pdf](https://www.cmu.edu/iii/degrees/admissions/bppe/mssm_jobclassification.pdf)

### **MSSM 16 Months, MSSM 12 Months, & MSSM Part-Time**

#### **Full-Time Status**

Full-time degree requirements for the MSSM 16- and 12-month curriculum are outlined below. Full-time students must attend courses and complete the degree on campus. Some courses may be offered during evening hours. Degree unit requirements are outlined below. All students are required to maintain full-

time status at 48 units per semester as set by the degree requirements. If a student is permitted to overload courses one semester for individual academic progress, the 48-unit requirement still applies in subsequent semesters.

### **Part-Time Status**

Students registered below 36 units are considered part-time. Students can complete the program part-time in two years (six academic semesters, including summer terms). Part-time students typically take 24 units of course in a semester. Part-time classes are typically offered in the evenings. If schedule permits, day-time courses could be considered by academic advisor recommendation.

### **Curriculum of Study for MSSM Full-Time 12-Month Degree**

#### **Fall Term**

##### **Required Course Units: 48 units**

- 49-760 – Foundations of Software Management – 12 units
- 49-754 – Integrated Thinking for Innovation – 6 units
- 49-774 – Product Management – 6 units
- 49-755 – Product Discovery & Definition – 6 units
- 49-786 – Software Engineering Management – 6 units
- Restricted Elective (placement at New Student Orientation) – 12 units

##### **Recommended/Optional Professional Development Course(s):**

- These courses may be taken in addition to the maximum 48 units.*
- 49-794 – Strategies for your Software Industry Career – 3 units

#### **Spring Term**

##### **Required Course Units: 48 units**

Maximum Course Units: 60 units

- 49-771 – Software Methods & Project Planning – 12 units
- 49-756 – Product & Business Modeling – 6 units
- 49-763 – The Business of Software – 6 units
- 49-757 – Solution Strategy & Marketing – 6 units
- 49-770 – Software Metrics – 6 units
- Elective Requirement – 12 units of approved electives

#### **Summer Term**

##### **Required Course Units: 48 units**

Maximum Course Units: 60 units

49-804 – Leadership & Teams – 6 units  
Elective Requirement – 42 units of approved electives

## **Curriculum of Study for MSSM Full-Time 16-Month Degree**

### **Fall Term #1**

#### **Required Course Units: 48 units**

49-760 – Foundations of Software Management – 12 units  
49-754 – Integrated Thinking for Innovation – 6 units  
49-774 – Product Management – 6 units  
49-755 – Product Discovery & Definition – 6 units  
49-786 – Software Engineering Management – 6 units  
Restricted Elective (placement at New Student Orientation) – 12 units

#### **Recommended/Optional Professional Development Course(s):**

*These courses may be taken in addition to the maximum 48 units.*  
49-794 – Strategies for your Software Industry Career – 3 units

### **Spring Term**

#### **Required Course Units: 48 units**

Maximum Course Units: 60 units

49-771 – Software Methods & Project Planning – 12 units  
49-756 – Product & Business Modeling – 6 units  
49-763 - The Business of Software – 6 units  
49-757 – Solution Strategy & Marketing – 6 units  
49-770 – Software Metrics – 6 units  
Elective Requirement – 12 units of approved electives

### **Summer Term**

#### **Required Course Units: 3 units**

49-793 - Practical Training in Software Management – 3 units

Students completing an internship may also take 12 units of coursework during summer term. Students are responsible for the additional tuition costs during summer term. Additionally, students must maintain full-time student status during subsequent semesters.

### **Fall Term #2**

#### **Required Course Units: 48 units**

Maximum Course Units: 60 units

**Required Courses**

49-804 – Leadership & Teams – 6 units

**Applied Learning Requirement – Complete One of the Following:**

49-792 - Software Management Practicum – 12 units

49-808 - Integrated Innovation for Large Scale Problems – 12 units

49-881 – Start-Up Creation in Practice – 12 units

**Elective Courses:**

30 units of approved electives

**Curriculum of Study for MSSM Part-Time Degree**

**Fall Term #1**

**Required Course Units: 24 units**

49-760 – Foundations of Software Management – 12 units

49-774 – Product Management – 6 units

49-786 – Software Engineering Management – 6 units

**Spring Term #1**

**Required Course Units: 24 units**

49-771 – Software Methods & Project Planning – 12 units

49-770 – Software Metrics – 6 units

Elective Requirement – 6 units of approved electives

**Summer Term #1**

**Required Course Units: 24 units**

24 units of approved electives

**Fall Term #2**

**Required Course Units: 24 units**

49-754 – Integrated Thinking for Innovation – 6 units

49-755 – Product Discovery & Definition – 6 units

Elective Requirement – 12 units of approved electives

**Spring Term #2**

**Required Course Units: 24 units**

49-756 – Product & Business Modeling – 6 units

49-763 - The Business of Software – 6 units  
49-757 – Solution Strategy & Marketing – 6 units  
Elective Requirement – 6 units of approved electives

### **Summer Term #2**

#### **Required Course Units: 24 units**

49-804 – Leadership & Teams – 6 units  
18 units of approved electives

### **Required Degree Units**

Students must complete a minimum of 144 units and successfully complete all required courses to be eligible for graduation. The average grade of 144 units applied to the degree shall be at least a B (3.0 QPA). Individual course grades below a C (2.0 QPA) are considered unsatisfactory for the degree requirement.

### **Integrated Innovation Institute - Course Descriptions**

#### **49-760, Foundations of Software Management - 12 units**

Students apply classic frameworks to research a public company that is currently operating in the software industry. Studying from a variety of perspectives - marketing, strategy, finance, operations - students learn how these companies are organized and how they make decisions. Students also develop practical skills in teamwork, research and professional writing, and presenting to executive audiences.

#### **49-750, Integrated Thinking for Innovation - 6 units**

The challenges our world is facing today signal an unprecedented need for innovators who can analyze wicked problems, understand and communicate system dynamics, and work effectively with stakeholders from multiple industries to generate viable solution pathways. Humanity's toughest problems require us to employ a multi-disciplinary approach and to develop a growth mindset to embrace new ways of thinking and working. Innovators need to learn how to take a holistic approach, understand a problem from multiple perspectives, and learn how to empathize with stakeholders.

In this studio course, students practice modeling complex problem landscapes, and engage in critical thinking through process retrospectives, and peer- and self-critique of work products. Combining frameworks and tools from several management and design technologies, students develop an integrated toolkit to guide intelligent problem exploration and framing.

**49-751, Product Management** - 6 units

Product Management plays an important role in a technology company. It is the organizational function responsible for guiding the strategic direction, development, and delivery of a product or set of products throughout its lifecycle, ensuring it meets both customer needs and business objectives. This course introduces graduate students to the principles and practices of product management. Students will learn how to develop a vision and strategy for a product, how to discover customer needs in order to develop product roadmaps, understand constraints that drive backlogs, align with corporate and competitive requirements, and make data-driven decisions to bring a product to market. The course will focus on hands-on exercises, case studies, and real-world examples to provide students with a comprehensive understanding of product management in the software industry. Guest speakers will share real-world best practices and the latest techniques.

**49-755, Product Discovery & Definition** - 6 units

Students select a meaningful business or social problem that can be improved in part by software technologies. Students develop a comprehensive description of the important dimensions of that problem by applying a variety of techniques. Students elicit and model customer requirements, perform an analysis of related products and services, and write a compelling vision of problem resolution. Students create a professional product description document that summarizes their analysis and provides several solution alternatives for the business or social problem they intend to improve.

**49-772, Software Engineering Management** - 6 units

In this course, you will learn the software engineering paradigms that are widely adopted in modern software industry. You will be introduced to the Generative AI augmented Software Development Life Cycles (SDLC) and its supporting process and tools in each stage. Through course long projects, you will gain firsthand experience on best practices in the art of software engineering management. You will be able to build AI-based software prototypes through iterative process of requirements definition, architecture design, implementation, integration, testing, and measurement.

**49-771, Process & Project Management** - 12 units

Students learn about existing philosophies and methods surrounding software development and study the dimensions of effective management for software projects. Working in teams, students define an optimal software development and project management approach for a given software project context by identifying an appropriate set of practices from Agile, Lean, and other industry proven approaches which are tailored to the project's specific needs. Students develop project estimates and multilevel plans based on their approach. Professional writing and presentation skills are emphasized.

**49-756, Product & Business Models** - 6 units

Students learn how to capture value from an innovation, converting new ideas to economic value. Students apply the tools of business modeling, including opportunity validation, value proposition, market identification, revenue generation and positioning. Students generate an appropriate business model to address the business or social problem they intend to improve.

**49-758, The Business of Software** - 6 units

The Business of Software course focuses on the processes and economics of bringing software products and services to market, emphasizing sales, delivery, and funding strategies. BSW focuses on the financial aspects of product development and go-to-market plans. An introduction to current operating models used by software-based businesses is used to evaluate whether a product idea or service concept has the potential to be a successful business and does it have funding potential.

**49-757, Solution Strategy & Marketing** - 6 units

Students learn how to commercialize a product in the dynamic high-tech industry. Students apply concepts of effective strategy for product delivery, including understanding the drivers for a strategic roadmap, creating scenarios for alternatives, market and technology analysis, and establishing metrics for business success. Students define a strategy and roadmap for delivering a minimum viable product to address the business or social problem they intend to improve.

**49-770, Metrics for Technology Products & Services** - 6 units

This course provides an introduction to common software technology and business metrics, tools, and processes. Skillfully created metrics, based on collected data, provide insights that enable effective product and service choices to be made. Metrics also answer questions to inform management decisions. Students learn to apply a goal-question-metric (GQM) model to design effective measurement proposals. Principles of change management are used to create a metrics program adoption strategy.

**49-761, Leadership & Teams** - 6 units

This course explores the dimensions of leadership and teams in the context of the challenges experienced by today's organizations, including the implications of the future of work. The topics covered in the course explore how leaders evolve throughout their careers and develop styles, versatility, and the ability to relate to others in meaningful and impactful ways. Leaders are studied on how they address work complexity and the value they place on teams and individuals. The materials covered in the course also address the significant need to lead teams, change, and culture as organizations become more automated and digital and as virtual workspaces become the norm. Employee engagement and

collaboration are explored from a systemic perspective and their impact on innovation and growth. Additionally, teams and their evolution are systematically considered to enable leaders to learn how to form and develop teams into high-performing and self-organizing creative entities.

**49-767, Organizational Behavior for the High-Tech Knowledge Industry - 6 units**

This course is about "organizational behavior" for high tech knowledge workers. Organizations are essentially human institutions. They are created by people, populated by people, managed by people, developed by people and operated by people. Understanding the fundamentals of human behavior is crucial for success. But people need to be grouped together and "organized" in order to make things happen, often under tight time and budgetary constraints. This course will focus on high tech organizational design and team effectiveness in other words, on the "execution" capability of a knowledge enterprise. Specifically, we will discuss how to organize a team, a business unit, or a company (including start-ups) that are operating in dynamic, global high tech ecosystems. The focus is on agility, flexibility, and the capacity to adapt to new business realities or crisis situations. High tech companies need innovative capabilities, entrepreneurial approaches, cross-silo collaboration, and resilient dispositions. A major challenge is to devise collaborative teams & organizational structures capable of making "sudden turns" and accommodating changing realities.

**49-802, Innovation & Entrepreneurship - 12 units**

This course focuses on entrepreneurship and innovation from the vantage point of high-tech companies in Silicon Valley. We explore these topics in the context of the Creation Phase - focusing on founding a new start-up and raising seed funding; and the Scaling Phase - focusing on growing a venture where startups typically undergo "B", and "C" rounds of funding. We examine common mistakes and misconceptions in starting a new entrepreneurial business, and meet entrepreneurs, angel investors, and venture capitalists from Silicon Valley to learn, first hand, the challenges of conceiving, creating, and growing a new venture. In the second part of the course, we focus on the Consolidation Phase - when growing ventures evolve into established global corporations. We examine critical pain points facing this group of companies, the impact of organizational complexity, the challenge of managing a multi-business enterprise, and expanding the global footprint. In this phase technology companies find it more challenging to innovate and often shift their growth focus to searching for acquisitions. Invited guests share their experiences and lessons learned, and give a first-hand perspective on the realities facing this critical group of innovative companies.

**49-787, Architecture & Programming Principles - 12 units**



Software products are becoming increasingly large and complex, and the responsibility of Software Product Managers has extended beyond core product functionality into non-functional aspects like cloud platform selection, scale and reliability decisions, interoperability with other products, and future extensibility considerations. For this, they rely heavily on their development team to architect and design products that are reliable, scalable, flexible, cost-effective and "future-proof." They are surprised when the product fails to meet these expectations - discovered only when the rubber meets the road - often too late to make any fundamental changes. These failures may manifest themselves in the inability of a product to scale the next million users, to integrate with other software systems, to support an international user base, or to enable sales through channels. This course aims to get product managers technically savvy about the non-functional aspects of a software system, and enable them to be influential in the architecture and design phase of product development. It will review a variety of architectures archetypes and analyze them for relevance to specific business requirements. It will also review some well-known products and explore their architectural characteristics. Students will architect and implement a software product using the principles learned in the course. Most coding will be done in Python, JavaScript and HTML. This course is designed for students with some experience in programming but who need to get a handle on architecture-level technical concepts.

**49-759, Integrated Innovation for Large-Scale Problems** - 12 units

This studio course focuses on team-based innovation across design, business, and engineering with the potential for large-scale impact. Students will take on a complex social problem, and methodically come up with unexpected ideas and opportunities to tackle and solve it. The semester will consist of a series of three modules where students will research the problem in its current form as well as its future manifestation, formulate a desired future state for the problem, and develop viable interventions that lead to a desired future. Students will work both individually and collaboratively, and will learn and apply systems thinking, design thinking, and futures studies to propose appropriate products, services, and policies. Students will seek the support industry experts and community stakeholders in the problem space, and will learn to co-create approaches to solving a complex social problem. Students must be accepted into this course before being able to register.

**49-782, User-Centered Research Methods for Product Innovation** - 6 units

Building great products and services begins with having a deep knowledge of the problem you are solving and the people for whom you are designing. From controlled lab studies to field research, A/B testing to participatory design, learn a host of Human-Computer Interaction research methods and analysis techniques to get you the right insights and on the path to crafting innovative ideas. We will cover a host of qualitative and quantitative user experience

research methods including interviewing, qualitative data analysis, survey design and analysis and usability testing.

**49-780, Human Computer Interaction & User Experience - 6 units**

An introduction to the field of Human Computer Interaction. The user interface and experience of a system, to a large measure, is perceived by the user as 'the system'. Innate human capabilities are discussed to understand how to make appropriate decision in designing user interfaces.

**49-781, Introduction to Machine Learning - 6 units**

The landscape of software products has changed over the last decade with the advent of data science as an interdisciplinary field, and its broad and deep applicability has created opportunities for delivering interesting and innovative capabilities based on deep understanding of data. This course helps current and future product managers understand the distinction between data-driven and conventional products and learn to identify new product capabilities made possible by quantitative data analysis and modeling. Regular hands-on exercises will expose them to techniques for analyzing data, developing insights, building models, and turning the outcomes from models into end-user value. The course project will require students to go through the life cycle of a data-product and showcase their insight as a product feature. Some class sessions in this course will be offered using a Flipped Classroom model where lectures will be distributed as videos for viewing offline, and class sessions are dedicated to clarifications, content review, and course assignments.

**49-783, Introduction to Cloud Computing - 6 units**

This class is designed to familiarize you with the state of the art in cloud computing and big data analysis. This course is suitable for both students on a technical track (engineering, science) as well as those on a management track who are passionate about big data powered products. You will study basic types of clouds, widely-used cloud computing systems and their strength and weakness, core concepts and technologies on distributed data storage, distributed processes and services, security practices, popular Big Data Analysis algorithms and machine learning use cases on cloud. You will acquire deeper understanding via both case studies from industry big players as well as a project-based hands-on application build and deployment on cloud (no technical pre-requisite).

After completing the course students will be able to:

- \* Build a basic product on two well-known cloud systems
- \* Make architectural decisions on choosing the right cloud type, core technologies and services
- \* Make business decisions on cloud vendors and the right level of investment on cloud
- \* Critique some current industry cloud-based solutions

**49-788, Introduction to IoT - 6 units**

This course provides an overview of Internet of Things (IoT), especially focusing on software layer of building mobile applications to capture and process data generated by IoT devices and providing analytical insights. Students will access health and fitness information, motion data, explore home automation technologies and beyond. Through this course, students will understand and appreciate why information technology is entering the era of digital transformation from pure Internet to IoT.

**49-789, Architecture Principles for Product Managers - 6 units**

Software products are becoming increasingly large and complex, and the responsibility of Software Product Managers has extended beyond core product functionality into non-functional aspects like cloud platform selection, scale and reliability decisions, interoperability with other products, and future extensibility considerations. For this, they rely heavily on their development team to architect and design products that are reliable, scalable, flexible, cost-effective and "future-proof." They are surprised when the product fails to meet these expectations, often too late to make any fundamental changes. These failures may manifest themselves in the inability of a product to scale the next million users, to integrate with other software systems, to support an international user base or to be sold through channels. This course aims to get product managers technically savvy about the non-functional aspects of a software system and enable them to be influential in the architectural and design phases. It will review a variety of architectural archetypes and analyze them for relevance to specific business requirements. It will also review some well-known products and explore their architectural characteristics. As part of the course, students will conceptually architect a product and debate its pros and cons. This course is designed for students who have some experience with product management and can relate to the challenges addressed in it. No experience with coding is necessary. This is offered as a synchronous-online course with a flipped classroom. Lectures are distributed as videos ahead of the class session. Class sessions are focused on clarification, content review, assignment review/feedback, and any collaborative work.

**49-792, Software Management Practicum - 12 units**

The practicum course involves application of MSSM program concepts in an actual business environment. Acting as consultants to one or more customers, student teams must scope a project; develop a project plan and detailed statement of work. Practicum topics are typically proposed by outside companies, which are looking to work with our students, but there are other options available as well. Students must demonstrate all deliverables to the customer(s), whose assessment of the work is a major component of the grade.

More than a simple internship, the practicum involves real responsibility, teamwork, accountability, and rigor. Students must follow the process for practicum participation outlined in the summer before being able to register into the course.

**49-793, Integrated Innovation Institute Internship - SV - 6 units**

This course is for 16-month MSSM students who are pursuing an internship. Satisfying the requirements of this course may be done in several ways: by working on-site at a designated company location (i.e. traditional internship), through a sponsored project (applied or research), or through a self-designed team project (requires approval.) Students plan and track their weekly activities, dialog with peers about their experiences, and submit a final paper reflecting on their summer project and how it relates to their career goals. Special permission is required to enroll; eligible students should contact their academic advisor. This course is only offered during the summer.

**49-794, Strategies for Your Industry Career - 3 units**

This course is designed for graduate students who are searching for an internship or job in industry, including those seeking to make a career shift within the high-tech industries. The course begins with self-assessment and aptitude activities. Students will discover careers available in today's industry by conducting research and listening to guest speakers (including alumni) who discuss roles, skills and prerequisites for career success. Students develop an understanding of the wide variety of companies operating in the high-tech space, and the various technical and management jobs available within them. Students learn how they can apply their skills to product and services companies. The outcomes for students include a personal brand statement that articulates skills valued by employers, discovery of their work preferences and aptitudes, a list of target companies to engage, and a plan to develop the materials (e.g. resume, interview preparation) required to conduct a successful job or internship search based on their new awareness and understanding of specific opportunities they wish to pursue.

Note: This course has no Distance Education Section available for MSSM Remote Part-Time students.

**49-784, Artificial Intelligence for Product Managers - 6 units**

The principles and practices around artificial intelligence (AI) is increasingly critical to unlock the value of data, and transform business and ultimately human experience. It is so pervasive today that we use it daily probably without knowing it. This course will present students AI business case studies, the most popular AI techniques, algorithms, application recipes, best practices, and offer hands-on experience in implementing them to solve real-world problems. This course covers the spectrum of real-world AI implementations from natural language processing, speech recognition, facial recognition, landmark detection, and social network analysis to technical depth of popular algorithms, neural

network backpropagation methods, probabilistic and non-probabilistic methods. Students will accumulate firsthand experience on Google and Microsoft AI platforms, AI model design and training. This course is designed with the easy-to-follow approach by showing the step-by-step implementation of the core technologies. It presents recipes in major use cases to offer students a leap start on building AI solutions. With the willing-to-learn attitude, students with either technical or business background will succeed in this course.

**49-765, Special Topics: Next Gen CIO** - 6 units

Today, every enterprise is driven by software, due to the combined impact of COVID, remote work and digital transformation. The role of the CIO is now elevated as tech tools have become the backbone of every business. The strategic significance of this role is now mission critical. The CIO is the point person for managing cloud infrastructure, data, software, supply chains, customer interaction, cybersecurity and innovation. In this course we will:

- A. Examine how the role of the CIO is evolving.
- B. Learn from seasoned and new CIO's how they are becoming strategic players in the enterprise.
- C. Explore future career opportunities in the CIO ecosystem.

**49-766, Agile Marketing for High Tech Innovation** - 6 units

Agile Marketing for High-Tech Innovations will cover how to formulate marketing strategies that lead to successful products. It will include how marketing strategies are adapted for high tech innovations and products including addressing strategic market planning, functional expectations and tactical considerations when using marketing tools. Topics include: strategic market planning, market orientation, types of alliances needed for moving from innovation to product acceptance, understanding high-tech customers, product distribution options, technology/product management considerations for marketing effectively, pricing, marketing communications, breakthrough versus incremental innovation marketing and measuring marketing effectiveness.

**49-801, Venture Governance: Boards, Executive Decision-Making, and Communications** - 6 units

The goal of the course is to teach founders of a high tech startup venture the requirements and process to be a director and how to manage their Board of Directors and Advisory Boards. The boardroom is where the governance of the venture occurs. The course will propose frameworks for understanding the complex dynamics among directors, executives, investors and shareholders. The key elements of the work boards do includes: strategic reviews, selecting, evaluating and compensating CEOs and other senior executives, company re-organizations, new director selection, managing top executive succession and dealing with various corporate crises. The role of the Boards is crucial in the value creation phase of a technology ventures trajectory. Conceptual

frameworks will be taught to effectively manage this crucial aspect of a ventures governance in real time. This course will cover the following topics: board participation and voting rights, Board of Directors responsibilities and liabilities, advisory board mentoring duties and shareholding vesting, managing Board of Directors, Directors and Officers Insurance and Compensation of Board Members, Board of Directors role during venture scaling, fundraising, firing & hiring CEOs and company officers, board members role during the Merger and Acquisitions transaction and during IPOs, and joining other boards.

Note: This course has no Distance Education Section available for MSSM Remote Part-Time students.

**49-803, Legal Issues in New Venture Creation - 6 units**

A critical part of creating a new venture is to provide the legal structure for both compliance and to prepare the venture for future success. For startups the legal profile of the company sets up the framework for growth. The course will cover basic legal requirements of incorporation, and additional options that need to be determined by the founders including equity distribution, board structure, employee stock option vesting, triggers for contingencies such as firing or acquisition and other issues. Another critical legal issue for both startups and established enterprises surrounds protecting intellectual property to immunize the companys strategic advantage as it gains velocity in the global market and encounters competition. Students will learn about various Intellectual Property tools and strategies to protect their product innovations and to understand the competitive marketplace, both in the US and globally.

Note: This course has no Distance Education Section available for MSSM Remote Part-Time students.

**49-800, Start Up Creation in Practice - 6 units**

For students with the goal of creating a new start up. This course is similar to an independent study, but is focused specifically on new venture creation. Students work on developing their technology-focused idea into a potentially viable company. Students can work individually or with a team including other students. Students must submit a proposal before being accepted into the course and each student (or team) must have an approved faculty advisor.

Note: This course has no Distance Education Section available for MSSM Remote Part-Time students.

**49-779, Artificial Intelligence Applications - 6 units**

Artificial Intelligence (AI) is a collection of multiple technologies that enable machines to sense, comprehend, act, and learn, either on their own or to augment human activities. AI has introduced new sources of growth, changing how work is done and reinforcing the role of people to drive growth in business, in every sector that matters. This Applied AI course offers students the knowledge of fundamental AI concepts, analysis of a variety of industrial applications, and the opportunities to have close-door discussions with the

leaders in the AI industry. The course focuses on AI introduction and the analysis of popular applications. Prerequisites of data science courses are not required. The objectives of this course are to provide students the ability to analyze why and how AI applications can impact a variety of industries, such as Self-driving, Healthcare, IOT, and explore opportunities and challenges through "real-world" case studies and projects.

**49-786, Special Topics: Developing Blockchain Products** - 6 units

In this course, future product managers will explore blockchain's transformative potential in their business domain. The course helps them understand blockchain's distributed and decentralized nature, cryptographic security, consensus mechanisms, tokenization, and immutability. In doing so, students will learn to discover the relevance of these characteristics to their own business domain, and identify new capabilities made possible by blockchain-enabled integrity and trust. To help them in the process, students will examine real-world applications in fields such as finance, supply chain, and healthcare.

**49-785, Special Topics: Leading Change for Digital Transformation** - 6 units

Digital Transformation is among the most critical initiatives that every enterprise is undertaking today. These initiatives are driven by the need to reach higher levels of process efficiency and significantly improve employee and customer experience. At the epicenter of this transformation are AI, sophisticated platforms with multiple interconnected applications, and the drive for highly capable ecosystems. To be adopted appropriately, technologies developed in digital transformations require significant human change for internal personnel and customers alike. Technology leaders can greatly benefit from understanding the methodologies and processes involved in human change to make technology easier to use and formulate the best means to implement and support it. This course will explore the common changes needed by users of technology in digital transformation initiatives. Further, it will introduce the change management methodologies and processes to lead to successful technology adoption. Assignments in this course will enable technology leaders to practice the change methodologies and gain enough knowledge to start applying them in their digital transformation efforts.

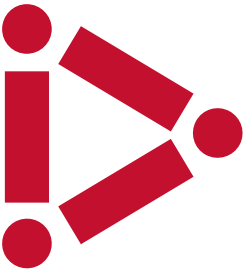
**49-769, Special Topics: Principles of Enterprise Flexibility** - 6 units

The software business is a story of innovation, adaptation, and evolution. Many of these startups and large enterprises alike, are based in Silicon Valley's Darwinian ecosystem, where waves of change are hyper-accelerated. Today this is illustrated by the explosion of GenAI which is driving the next innovation cycle. Building on over 20 years of research, this course will focus on the Silicon Valley playbook for managing complexity and fluidity, where kaleidoscopic change is a constant. The Super-flexibility framework will be used to describe how effective leaders engage in deliberate adaptation in a continuously morphing context. We

define super-flexibility it as the ability to remain consistent by withstanding turbulence, while simultaneously adapting to better fit with this morphing environment. This course will focus on:

- A. The super-flexibility playbook for thriving in dynamic ecosystems.
- B. Case examples from leading tech companies and innovators
- C. Concrete tools and practices that bridge the knowing-doing gap





## Carnegie Mellon University - Schedule of Classes

<https://enr-apps.as.cmu.edu/open/SOC/SOCServlet/search>

### Student Affairs & Career Services Resources

#### Student Affairs:

Students on the Silicon Valley campus can meet with the Assistant Dean of Student Affairs, Lauren Schachar, for on-site connection to various student services resources. These resources include questions regarding public transportation, health, personal concerns, student organizations, activities and general campus information. Lauren Schachar's office is located in B23 Room 217A, and can be reached by phone at 650-335-2844 or email at [lauren.schachar@sv.cmu.edu](mailto:lauren.schachar@sv.cmu.edu).

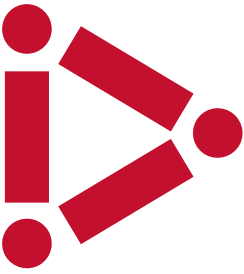
#### Public Transportation:

Students are given a VTA clipper card (Smart Pass) during orientation, which provides them with free access to the local VTA bus system and the local light rail. If students live near a Caltrain station or require Caltrain to get to school or work, they can apply for a Caltrain Go Pass at the Student Affairs office, located in Building 23, Room 215B.

#### Health/Personal Concerns:

The Assistant Dean of Student Affairs is the point person for any student who is in distress or experiencing a crisis. Student Affairs consults with CMU's Counseling and Psychological Services (CaPS) in Pittsburgh to support students in these circumstances. The director also works closely with CaPS to provide training for SV faculty on identifying and supporting students in distress.

To further promote student access to physical and mental health services, the campus contracted with One Medical to provide students with local, timely access to health care. All students, staff, and faculty are now provided with a membership to One Medical, which provides same



day and next day appointments at any of their locations. There are three main locations near the SV campus. The company also provides 24/7 support via their mobile app, including video consultations with a doctor. All full time students are also required to have health insurance. CMU's student health insurance department helps students to enroll, waive (if they have insurance that meets the university requirements) and navigate and use insurance.

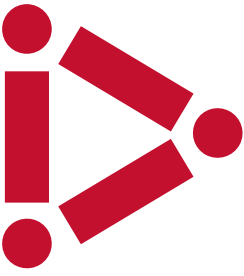
### **Student Organizations and Activities:**

Students are encouraged to join student organizations during orientation and welcome week by requesting information (through an online form) and meeting the student organizations on campus. The online form is provided during the Action lab at new student orientation and can also be found on our website at <http://sv.cmu.edu/student-services/student-organizations.html>.

Student activities are promoted through a weekly CMU-SV Student Newsletter sent by the Assistant Dean of Student Affairs, Lauren Schachar. Students can find out about opportunities, events and activities through the newsletter, the student events calendar (which they can access once they have their school google accounts set up) and through the digital displays and posters on campus.

**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.

Students in Silicon Valley can meet with Associate Director of Career Services Leigh Mason. Appointments can be made through Handshake. Career Consultants hold open office hours, which are communicated at the beginning of each semester.

### **Job Search Guidelines:**

Departments 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 the 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 their ethical job/internship search policy. Students who do not follow such guidelines may forfeit their on campus interviewing and/or resume submission privileges.

### **Student Grievances:**

Grievances can be brought directly to the Assistant Dean of Student Affairs or the Director of Student Affairs. For students who wish to submit a concern online, they can do so at the online Student Suggestions Box at <http://goo.gl/forms/BySlZMoB6txYDKz02>.

## **Integrated Innovation Institute - Graduate Student Handbook**



Please review the link below for more information on degree requirements, student services, career services/placement resource and student achievements for graduation.

[https://www.cmu.edu/iii/current-students/pdfs/2023-2024-handbook\\_on-campus.pdf](https://www.cmu.edu/iii/current-students/pdfs/2023-2024-handbook_on-campus.pdf)

## FACULTY

### 2024-2025 Integrated Innovation Institute Faculty Members

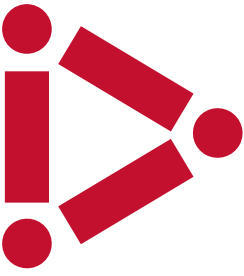
#### **Anglin, Deana** **Adjunct Professor**

- Doctor of Philosophy (PhD) in Human-Centered Computing  
Georgia Institute of Technology
- Master of Science in Human-Computer Interaction (IT)  
Rochester Institute of Technology
- Bachelor's in Computer Science, Math & Spanish  
Lawrence University

#### Bio

Dr. Deana Anglin is a Senior User Experience Researcher at Google with over 10 years of experience doing user-centered design research. As a designer of global products and services, Deana is most often found in-field learning about people across Asia, Africa, Europe and North America. Her work informs product strategy and innovation in new markets, most notably Google's food and home services delivery platform launched in India last year. She is also a UX mentor to emerging-market startups in Google's Launchpad accelerator program.

Deana received a PhD in Computing from Georgia Tech where she focused on design at the margins - designing with and for the refugee and immigrant community. Her research landed her several prestigious



fellowships and awards from companies like Intel and Google. Her work is published at top venues such as CHI, Ubicomp and IFIP.

### **Areas of Expertise**

Technology Design for International and/or Emerging Markets, Service Design, Social computing, Mobile computing, Information and Communications for Development (ICTD)

### **Dai, Xueying (Lake) Adjunct Professor**

- Master of Business Administration (MBA)  
University of Southern California, Marshall School of Business
- Bachelor of Science in Economics  
Beijing International Studies University

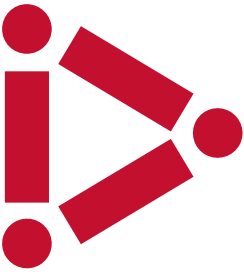
<https://www.linkedin.com/in/lakedai/>

### **Bio**

Lake Dai is an entrepreneur, venture capitalist, and a partner at the venture capital firm, LDV Partners. Here at Carnegie Mellon, she is an adjunct faculty at our Silicon Valley campus, teaching students of our Software Management program.

For 20 years, Lake has led product and engineering teams globally at Alibaba, Apple, Yahoo!, and Overture. She is a recognized expert in Search Engine, Ad Platform, Marketplace, Analytics, and Mobile Platforms and Applications, holding several U.S. patents in search algorithm, search tokenization, mobile data analytics, and mobile monetization.

In China, Lake was employee #84 at Alibaba, launching the first generation of profitable marketplace and travel products. At Yahoo!



China, her team launched the first generation of web and vertical search products, tripling Yahoo!'s market share within one quarter.

In the U.S., as a co-founder Shinect, a non-profit acceleration program designed to connect Silicon Valley's entrepreneurs to China's market, she has been helping companies build successful products and profitable businesses. She also mentors start-ups at various incubators including 500 Startups, Muckerlab, Lab360 and Shinect.

Lake is on the Advisory Board of Women In Technology International (WITI), the premiere global organization empowering women in business and technology. She is also a Board Governor and Chairwoman of the US Chapter of QianChengHui, a non-profit organization which fosters entrepreneurship for Alibaba alumni worldwide.

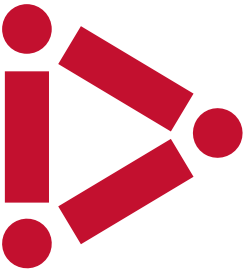
**Evans, John Stuart**  
**Distinguished Service Professor**

- Doctor of Philosophy (PhD) in Technology Policy  
Aston University
- Master of Science in Operations Research  
Aston University
- Visiting Scholar at the Graduate School of Business  
Stanford University

<https://www.linkedin.com/in/stuart-evans-58857125>

**Bio**

Dr. Stuart Evans is a board member, educator, author, and expert on dynamic high-tech ventures. As a Distinguished Service Professor, he shares his expertise by teaching related coursework for our degree programs in Silicon Valley including the M.S. in Software Management. Additionally, Stuart is the Director of the [CMU-Emirates iLab](#), a



partnership between Iii and Emirates Airlines for innovative education and research specialized for the airline industry.

Stuart's professional career spans across many areas of entrepreneurship, featuring extensive experience within the tech ecosystem of Silicon Valley. He has conducted research for SRI International and Stanford Graduate School of Business; consulted with Bain and Company; worked in investing for Sand Hill Venture Group; and served as executive management for Shugart Corporation, a Xerox subsidiary. Prior to his time in Silicon Valley, he taught at The Cambridge University's Judge Business School.

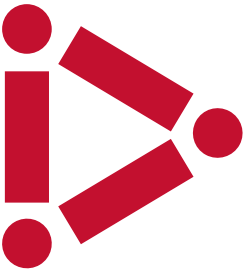
In addition to his experience in academia and industry, Stuart has published widely on high-tech ventures. His latest book, Super-Flexibility for Knowledge Enterprises, puts forward a practical toolkit for dynamic adaptation in high-tech ecosystems. The book is based on 28+ years of collective field research and practical experience in Silicon Valley of both Stuart and his co-author Homa Bahrami, a professor of the University of California at Berkeley's Haas School of Business.

#### Areas of Expertise

High-Tech Entrepreneurship & Innovation, Dynamic Start-up Strategies, Venture Financing

#### **Fang, Fang (Catherine) Instructor of Integrated Innovation**

- Doctor of Philosophy (PhD) in Computer Engineering  
Northwestern Polytechnic University
- Master of Science in Software Management  
Carnegie Mellon University
- Bachelor of Science in Information Management  
Peking University



<https://www.linkedin.com/in/catherine-fang-008849/>

#### Bio

Catherine Fang is an entrepreneurial product leader who is passionate about building intelligent software products powering both social networking at large-scale and enterprise platforms. She has 18 years of product management, go-to-market strategy, and software development/architect experience managing products with globally distributed resources (U.S., UK, Hungary, India, China, Japan, Brazil, etc). Catherine specializes in areas including: machine learning-based social network content recommendations, global digital audience targeting strategy for content marketing and advertising, and audience look-alike modeling.

In addition to her role at the Integrated Innovation Institute, Catherine works as a Senior Product Manager for LinkedIn and is the co-founder and CEO of ECAdvisor, an educational platform for software product strategy consulting and personalized recommendations. Previously, she has worked in software and product roles at companies including Yahoo, BlueKai (acquired by Oracle), Sun Microsystems, and Stratify.

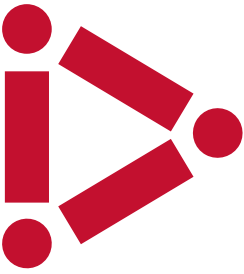
#### Areas of Expertise

Product Management, Go-to-Market Strategy, Software Development/Architecture

#### **Kirmayer, Matt** **Adjunct Professor**

- Juris Doctor  
Rutgers University School of Law
- Master of Laws  
New York University School of Law





- Bachelor of Arts  
State University of New York at Albany

<https://www.linkedin.com/in/mkirmayer/>

#### Bio

Matt Kirmayer represents emerging technology companies and the investors who fund them across a range of industries, including software, educational technology, digital media, social media, artificial intelligence systems and life sciences. Active in the technology and investment communities in Silicon Valley and the East Coast, Matt often works with emerging companies as their outside general counsel, managing legal, financial and operational issues, from formation and angel and capital investment through to exit, that arise when entrepreneurs enter the marketplace.

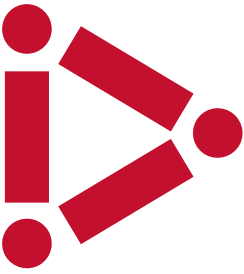
Matt has more than 25 years of experience in the emerging company and venture capital ecosystem, including numerous seed and venture financings for technology and life science companies. Matt also has a background in guiding clients in securities offerings and mergers and acquisitions.

As part of his commitment to gender equality, Matt sits on the advisory board of Astia, which is a nonprofit organization that invests in companies with women in positions of equity and influence. Matt is a mentor at the Lester Center for Entrepreneurship at the Haas School of Business at the University of California Berkeley and a Sky Advisor to SkyDeck, the unique accelerator at UC Berkeley.

#### Areas of Expertise

Corporate Law, Venture Capital

#### Ott, Adrian



## Adjunct Professor

- Master of Business Administrative (MBA), Harvard Business School  
Carnegie Mellon University
- Bachelor of Science  
University of California, Berkeley

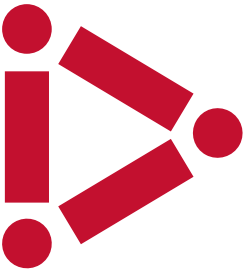
## Bio

Adrian Ott is an award-winning entrepreneur, author, and former senior-level tech executive with a proven track record for visionary business strategies that result in exponential revenue. She has led billion-dollar high technology organizations and assisted innovative ventures to identify and commercialize new product opportunity. *Consulting Magazine* called her “One of Silicon Valley’s most respected strategists.” As CEO and founder of a technology services business in 2001, Harvard Business School and NAWBO recognized her as one of the most inspiring leaders in Silicon Valley.

In addition to teaching technology venture classes at Carnegie Mellon Silicon Valley, she serves on the National Faculty for the NSF Innovation Corps (National Science Foundation I-Corps). As a National Adjunct, she assists cohorts of promising technology entrepreneurs to commercialize innovations they have developed at top U.S. universities. She has also served in fiduciary and advisory board roles at private for-profit corporations.

Adrian is the award-winning author of two business books that won Best Business Book of the year accolades. She has contributed thought-leading articles to *Fast Company*, *Harvard Business Review* and has been featured in national business television, radio, and publications such as *Forbes* on the latest trends.

Prior to founding her own company, she was an HP executive for 15 years serving in functions such as product management, new ventures,



strategic alliances, marketing, and software development. She was recognized in an annual report for “infusing HP with new revenue streams, new technologies, and new business models.”

#### Areas of Expertise

Commercializing Technology, Go-To-Market Strategy and Business Models, Venture Management/Governance, Strategic Alliances

#### **Mercier, Gladys**

#### **Program Director, M.S. Software Management**

- Master of Business Administration (MBA)  
Carnegie Mellon University
- Master of Software Engineering  
Carnegie Mellon University
- Bachelor of Science in Computer Science  
University of Pittsburgh

<https://www.linkedin.com/in/gmmercier/>

#### Bio

Gladys M. Mercier has 12 years of software engineering experience with a focus on industrial automation systems for steel manufacturing. She has been a certified professional project manager (PMP) since 2002 and has served in a variety of roles throughout her career, including analyst, developer, designer, architect, tester, trainer, and team lead. Gladys joined Carnegie Mellon in Silicon Valley in 2003 and has played an instrumental role in the growth and success of the M.S. in Software Management (MSSM) program.

In addition to her role as MSSM's Program Director, Gladys teaches related coursework as a faculty member and is the academic advisor for



both the MSSM program as well as the Information Networking Institute's MSIT-SM program.

Gladys grew up in Sacramento, California and attended college in Boston and Pittsburgh, PA. After earning her undergraduate at the University of Pittsburgh, Gladys launched her software career in the city's steel manufacturing industry. Her work allowed her to travel extensively, installing systems in many cities in the U.S. and Brazil.

Gladys has been a part of the Carnegie Mellon community for nearly 20 years. After earning her master's degree at CMU, Gladys developed and taught a project management course for Heinz College. When she moved back to California, she continued her CMU career by joining the Silicon Valley campus.

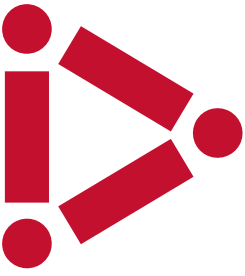
Gladys spends her free time both outside and on the ice. She studies landscape architecture, urban design, and California native plants. Her favorite pastime is playing ice hockey, traveling across the U.S. as part of winning teams and leagues. After living in Pittsburgh for 16 years (and during the Mario Lemieux era), Gladys continues to be a devoted Pittsburgh Penguins fan, despite the cheers of her San Jose Sharks-loving neighbors.

#### Areas of Expertise

Project Management, Software Engineering, Teamwork, Interpersonal Skills

#### **Miller, David** **Adjunct Professor**

- Master of Science in Information Technology  
Carnegie Mellon University
- Bachelor of Science in Accounting  
Syracuse University



## Bio

David Miller is an entrepreneur, a product team leader, an advisor and educator. David works with F500 companies as well as VC backed start ups to help find the elusive product market fit and build and manage teams of product managers, designers and developers.

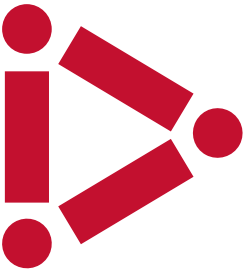
Throughout his career, David has worked with companies big and small to bring game changing products to life. David has consulted or worked for companies including Comcast, Oracle, Nextel, Sprint, Prudential, GMAC Commercial Mortgage, SEI Investments, and Cushman & Wakefield. He personally founded three companies in the ad-tech, payment processing, and ride sharing industries.

Currently, with AgileEngine, an award-winning product development firm, David helps companies accelerate and hone their product development. By building hi performing on-shore/off-shore teams, David helps companies move faster and more efficiently to launch and maintain products, reduce backlogs, build integrations, scale and gain market share.

David's focus areas include product management leadership, mentorship, organizational design and conversations that focus on how to unlock creative potential. Also, how organizations create hi performing teams through an inclusive environment that values and honors respect for differences, humility, difficult dialog, managed conflict, hard decision making, resilience, empathy and risk-taking to meet the grand challenges of tomorrow.

## Areas of Expertise

Entrepreneurship, Product Development, Product Management, Hi Performing Teams, Corporate Innovation



**Mohan, Shantha**  
**Executive in Residence, iLab**

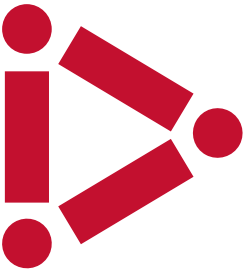
- Doctor of Philosophy (PhD) in Operations Management  
Tepper Business School (GSIA), Carnegie Mellon University
- Bachelor of Engineering in Electronics and Communication  
Engineering  
College of Engineering, Guindy (CEG), Chennai, India

<https://www.linkedin.com/in/shanthamohan/>

**Bio**

In her current role as Executive In Residence at the Integrated Innovation Institute, Shantha co-delivers courses, contributes to curriculum design, and mentors students in their projects and practicums.

Shantha is a senior software engineering leader and entrepreneur, with proven track record of growing and mentoring technical teams and generating ROI for customers across the globe. Retail Solutions Inc., the company she co-founded, is a leader in Retail Analytics in the Consumer Packaged Goods domain. She ran product development for the company and was responsible for scaling the product development team across the world and deliver multiple analytic applications. Prior to Retail Solutions, she has over 20 years of experience focusing on mission-critical systems to support semiconductor and other high value added manufacturing. At Consilium, now part of Applied Materials, she managed development of three generations of Manufacturing Execution Systems. Such software systems are mission critical, highly scalable, and highly available systems, and companies such as Intel and Infineon depend upon them for their manufacturing.



Outside CMU, she mentors startups and provides career advice in Product Management and software development careers. Her book “Roots and Wings – Inspiring stories of Indian Engineering Women” is forthcoming.

#### Areas of Expertise

Software Enterprises, Entrepreneurship, Product Management, Global software development

#### **Morey, Timothy** **Adjunct Instructor**

- Master of Business Administration (MBA)  
Hass School of Business, University of California Berkeley
- M. Litt/MA Philosophy  
University of Aberdeen

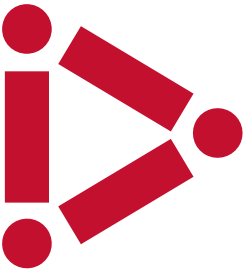
<https://www.linkedin.com/in/timothymorey/>

#### Bio

Timothy Morey is a leader in product strategy, innovation and design. Throughout his career, he has worked with public and pre-IPO companies across retail, automotive, consumer, healthcare and technology sectors to bring new products and services to market.

Currently he is the Global Head of Method ([www.method.com](http://www.method.com)) a digital product consultancy that is part of GlobalLogic and Hitachi, where he leads a team of 300 engineers, product managers and designers. Prior to joining Method, Tim led frog design, a global creative consultancy.

Tim regularly speaks on innovation, strategy and design and his frameworks have been published in strategy and business publications including Harvard Business Review.



#### Areas of Expertise

Executive management, Product Strategy, Innovation Management, Design-thinking and human-centered design, Product Management, Creative/digital consultancy management

#### **Prayaga, Shyamala** **Adjunct Instructor**

- Bachelors of Engineering, Civil Engineering  
Rajiv Gandhi Proudtyogiki Vishwavidyalaya

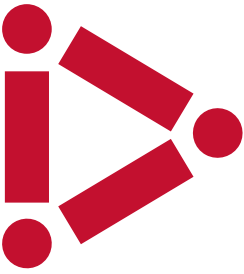
<https://www.linkedin.com/in/shyamalaprayaga/>

#### Bio

Shyamala Prayaga is a distinguished Senior Software Product Manager at NVIDIA, where she serves as a driving force behind innovation and creativity in the fields of Conversational AI, Generative AI, Deep Learning, and User Experience (UX). With a career spanning over two decades, Shyamala has solidified her reputation as a visionary leader, speaker, and author in the realm of artificial intelligence and inclusive design. She has not only played key roles at prominent companies but has also ventured into the realm of education as the founder of the Digital Assistant Academy.

Shyamala's career is marked by her dedication to user experience (UX) and voice technology. With over 23 years of experience, she specializes in designing intuitive and user-centric interfaces, contributing to the usability and customer satisfaction of various platforms. Her journey encompasses over ten years of expertise in crafting voice interfaces for Connected Home Experiences, Automotive, and Wearables, showcasing her deep knowledge in the field.





In addition to her practical contributions, Shyamala authored the book "Emotionally Engaged Digital Assistant: Humanizing Design and Technology." The book provides frameworks and principles for implementing trustworthy and emotionally engaging voice interfaces, making it an invaluable resource for those in the field.

#### Areas of Expertise

User Experience and Design, Human Computer Interaction, Product Design, Product Management, Human-Centered Design, Design Research, Artificial Intelligence

#### **Root, Sheryl**

#### **Associate Professor of the Practice**

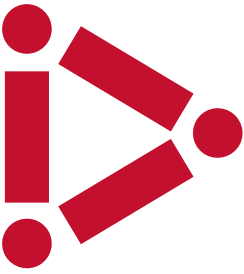
- Master of Business Administration  
Stanford University
- Undergraduate Degree  
University of California

<https://www.linkedin.com/in/sheryl-root-703b792/>

#### Bio

Based at CMU Silicon Valley, Sheryl Root an Associate Professor of the Practice for the M.S. in Software Management program. In her role as director and faculty, Sheryl both develops curriculum and teaches courses that merge technology with entrepreneurship.

Outside of CMU, Sheryl is the owner of RootAnalysis, a consulting firm specializing in corporate strategy and marketing. For more than 13 years, Sheryl's firm has worked with C-level Silicon Valley executives at high-tech companies, such as HP-Compaq, Oracle/PeopleSoft, Hyperion, Philips, Novell, and many startup organizations.



Prior to joining academia, Sheryl had an extensive career in the software industry, including a 20-year tenure working for Hewlett-Packard (HP). While at HP, she excelled in a number of roles, including Director of Business Strategy, Director of Marketing Operations for Services, Director of the Software Initiative, and Manager of Unix environments. Specializing in the area of software, she led internal teams of consultants for HP operations across the globe, advancing the company's process practices in software engineering and business management.

Sheryl is a leader, board member, and advocate for many world-renowned institutes and organizations. She is Chairman of the Advisory Board for Women in Technology International (WITI), a member of the Board of Advisors for the Stanford Business School Sloan Program, and board member of Netswitch Technology Management. She has coached numerous startups to achieve success in high-tech industries. Additionally, she is a frequent speaker in high-tech subject areas such as agile marketing, strategy, women in STEM, career planning, leadership, new business models, and organizational structures.

Outside of work, Sheryl is an connoisseur of wines and previously owned her own vineyard. In a previous life, she used to race cars.

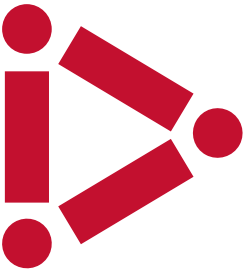
#### Areas of Expertise

Business Models & Strategy, Leadership, Agile Marketing, Product Management, Team Dynamics

#### **Saadati, Omid**

##### **Adjunct Professor**

- Master of Science in Software Management  
Carnegie Mellon University
- Bachelor of Science in Computer Science  
The University of Utah
- Bachelor of Science in Civil Engineering



Baha'i Institute for Higher Education

<https://www.linkedin.com/in/omidsaadati/>

#### Bio

Omid Saadati is an accomplished entrepreneur, product leader and technologist with over a decade of experience in developing strategies and leading organizations. Omid's expertise lies in building and scaling developer platforms across various sectors including ad-tech, commerce, and cloud-based networking. He has had key positions at industry-leading companies such as Google, Meta, and Cisco.

Currently, Omid leverages his extensive experience to advise high-potential startups and mentors early-career individuals in the technology sector. He also serves as the chief product officer for an AI-based startup operating in the national security and open source intelligence (OSINT) domain.

Omid's core competencies encompass areas identifying product-market-fit, formulating go-to-market strategies, and managing products. His industry focus includes ad-tech, commerce, and developer platforms. His strategic insights and leadership have consistently driven growth and innovation in these areas.

#### Areas of Expertise

Product Management, Product Strategy, Go-to-Market Strategy, Business Model Architecture

#### **Shaikh, Karimulla** **Instructor of Integrated Innovation**

- Doctor of Philosophy (PhD) ABD, Computer-Aided Engineering & Management



- Carnegie Mellon University
- Master of Science in Computer-Aided Engineering  
Indian Institute of Technology, Madras
- Bachelor of Technology  
Indian Institute of Technology, Madras

<https://www.linkedin.com/in/karimullashaikh>

#### Bio

Karim has built his career over the last 20 years as a seasoned product development executive at both startups and publicly-traded companies. He currently leads product development at Virtual Power Systems, a startup focused on intelligent software-defined power for data centers. Prior to that, he was Senior Vice President of Product Development at SDL Language Technologies, a global leader in delivering machine translation and translation management systems to Fortune 100 companies. His experience leading product management and software engineering spans a wide range of domains.

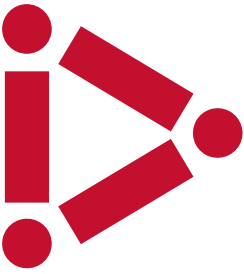
While he enjoys getting into the technical guts of scalable and reliable cloud products for enterprises and professionals, Karim is also passionate about building high-performance teams by simplifying people and process interactions.

#### Areas of Expertise

Cloud Software, Enterprise Product Development, Machine Learning,  
Solving Large Scale Problems

#### **Taborga, Jorge** **Adjunct Professor**

- Doctor of Philosophy (PhD) in Organizational Systems  
Saybrook University



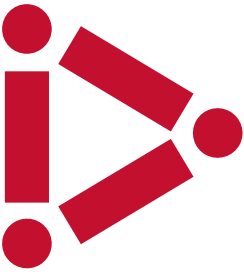
- Master of Science in Computer Science  
Texas A&M University
- Bachelor of Science in Computer Science  
Texas A&M University

### Bio

Jorge Taborga is an accomplished leader in organizational transformation and growth in high tech, healthcare, and cloud services. Across his career, he has led company-wide strategies; developed numerous hardware and software products, and cloud services; re-engineered company-wide business processes; implemented enterprise-wide IT systems; integrated a large number of company acquisitions; and built and mentored many engineering and IT organizations.

Jorge was recently an Executive Vice President at Omnicell, Inc., where he was responsible for product development of this medical devices company. Prior to this assignment, he was this company's Vice President of Manufacturing, Quality, and Information Technology. Before Omnicell, Jorge delivered management consulting services to large enterprises and startups in the areas of strategic planning, go-to-market strategies, business case development, organizational development, supply chain optimization, and large system implementations. He was the Senior Vice President of Technology Operations at Terraspring and fusionOne, both cloud service startups delivering innovations in cloud storage and infrastructure as a service. Jorge also was Vice President and CIO at Bay Networks. Before that, he was Director of Enabling Technologies for Quantum Corporation, leading the business and systems transformation of that company. Earlier in his career, Jorge held a number of product development and leadership positions with ROLM and IBM

In addition to his role at the Integrated Innovation Institute, Jorge is consulting with high growth companies on team and organizational



adaptability. He is also lecturing Organization Development topics in the US and China.

#### Areas of Expertise

Hardware and software product development, organizational and team adaptability, organizational behavior, change and transformation, and M&A post-merger integration

#### **Thomas, Ravi**

#### **Associate Professor of the Practice**

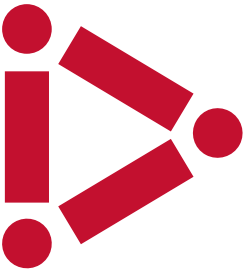
- Doctor of Philosophy (PhD) in Economics  
University of California, Berkeley
- Bachelor of Science in Mathematical Economics & Econometrics  
The London School of Economics & Political Science

<https://www.linkedin.com/in/ravi-thomas-8b14a65>

#### Bio

Based at Carnegie Mellon's Silicon Valley campus, Ravi specializes in teaching entrepreneurial and new venture coursework for our M.S. in Software Management program. He also mentors CMU-based startups as the director of [VentureBridge](#) program, a program open to CMU students and alumni seeking to launch their own high-tech businesses.

Ravi has held senior-level executive positions at several startups. He co-founded Jareva Technologies and served as CFO and a board member. During his time with Jareva, Ravi engaged in all aspects of the company from its founding as a service business, to its repositioning as a software product company, to its revenue stage and successful exit through an acquisition by Veritas. Prior to founding Jareva, he was the CFO of PostX, a company in the secure messaging arena. As CFO, he was involved in raising over \$30 million for PostX and Jareva through venture capitalist



firms including Mayfield, Hummer Winblad, and Labrador. Additionally, Ravi is a Consulting Chief Financial Officer for several startups. Previously, he was CFO of University Associates, LLC (UA LLC). UA LLC was formed by the Regents of the University of California and the FHDA Community Colleges holds the master lease on 77 acres of NASA Research Park at Moffett Field.

Prior to joining his first startup, Ravi was an Assistant Professor at the Fox School of Business at Temple University, where he taught graduate and undergraduate courses in microeconomics, economics of information, and public finance. He has also taught at Swarthmore College and was a Visiting Fellow at the International Monetary Fund.

Areas of Expertise

Entrepreneurship, New Venture Strategy

Additional Information about Integrated Innovation faculty and staff can be found here: <https://www.cmu.edu/iii/innovators/index.html>

### **ADMISSIONS INFORMATION**

Information about Integrated Innovation Institute's Admissions requirements can be found

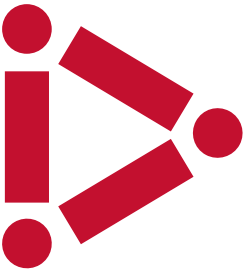
here: <https://www.cmu.edu/iii/degrees/admissions/index.html>

### **Transfer Credits & Articulation Agreements**

The Integrated Innovation Institute does not accept transfer credits from other institutions for any of its graduate degree programs. Additionally, the Integrated Innovation Institute does not have any transfer or articulation agreements.

### **Prior Experiential Learning Credit Policy**

The Integrated Innovation Institute does not award credit for prior experiential learning experiences before starting a degree program.



## Services to International Students

Carnegie Mellon University does admit students from other countries. The Carnegie Mellon Office of International Education (OIE) provides visa services for F-1 and J-1 international students as required by Department of Homeland Security regulations. These services, and related services such as advising and preparation of required documents, are provided to students at no additional charge.

Carnegie Mellon's Office of International Education (OIE) advises international students and scholars regarding immigration/visa and acculturation issues, issues visa documents with which international students and scholars may apply for US visas. Visa documents are issued, per federal regulations, upon request from students who are admitted to full-time programs and who have sufficient, demonstrated financial resources. OIE complies with federal reporting requirements with respect to students/scholars on CMU visa documents and educates students with respect to their own responsibilities for maintaining legal status in the US.

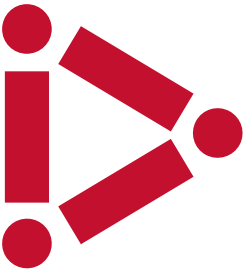
All F and J students/scholars are required to attend a mandatory Orientation and Immigration Check-In upon arrival to their CMU campus or location. The OIE orientation provides legally-required information regarding maintaining status. For those students who participate in Optional Practical Training (OPT) or Curricular Practical Training (CPT), mandatory information/application sessions are provided. These sessions are presented remotely, as needed, by a Carnegie Mellon OIE Designated School Official (DSO). Individual students who have immigration questions or concerns meet with designated OIE advisor during individual, scheduled advising appointments.

For more information, students may view the website or call OIE:

<https://www.cmu.edu/oie/foreign-students/index.html>

By phone: 1(412) 268-5231





### **English Language Proficiency Information**

Admission to Carnegie Mellon University graduate programs requires demonstration of completed, relevant undergraduate degree programs, as demonstrated by an original transcript from the degree-granting institution during the admission process. Domestic students who graduate from an accredited college or university in the US have demonstrated their English language facility and skill by their success and graduation from competitive undergraduate US institutions.

### **TOEFL, IELTS, or Duolingo Requirements**

Applicants whose native language (mother tongue) is not English must provide TOEFL, IELTS, or Duolingo scores. The Integrated Innovation Institute requires a minimum score of 95 for IBT (with no sub-score below a 23), a minimum score of 6.5 for IELTS, and a minimum score of 105 for Duolingo

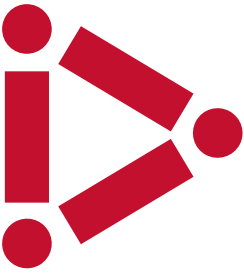
Non-native English speakers may utilize Communications and Language Services Office for additional language support for nonnative English speakers: <http://sv.cmu.edu/student-services/communication-language-services.html>

### **Language of Course Instruction**

All instruction occurs in English.

### **NOTICE CONCERNING TRANSFERABILITY OF CREDITS AND CREDENTIALS EARNED AT OUR INSTITUTION**

The transferability of units you earn at Carnegie Mellon University is at the complete discretion of the institution to which you may seek to transfer. Acceptance of the degree you earn in the Program is also at the complete discretion of the institution to which you may seek to transfer. If the units or degree that you earn at this institution are not accepted at the institution to which you seek to transfer, you may be required to repeat some or all of your coursework at that institution. For this reason,



you should make certain that your attendance at this institution will meet your educational goals. This may include contacting an institution to which you may seek to transfer after attending Carnegie Mellon University to determine if your credits, or degree will transfer. The Integrated Innovation Institute does not accept transfer credits from other institutions for any of its graduate degree programs.

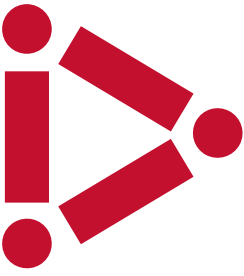
### **STUDENT'S RIGHT TO CANCEL (WITHDRAWAL/LEAVES OF ABSENCE)**

A student has the right to cancel the student's Enrollment Agreement by either taking a leave of absence from the Program (leaving Carnegie Mellon University temporarily with the firm and stated intention of returning) or by withdrawing from the Program (leaving Carnegie Mellon University with no intention of returning). If the student withdraws or take a leave of absence from Carnegie Mellon University, the student may be eligible for a tuition adjustment or a refund of certain fees (excluding any Application Fee, Registration Fee and Enrollment Deposit).

To cancel the student's Enrollment Agreement and take a leave of absence or withdraw, the student must complete Carnegie Mellon University's Leave of Absence or Withdrawal form, as applicable, and return it to Carnegie Mellon University's Registrar's Office, at 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213. The Leave of Absence and Withdrawal forms, and additional information about leaves of absence and withdrawal, can be found on Carnegie Mellon University's website at <https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/>.

If the student notifies Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is the earliest of:

- The date the student began the student's withdrawal or leave of absence process at Carnegie Mellon University;



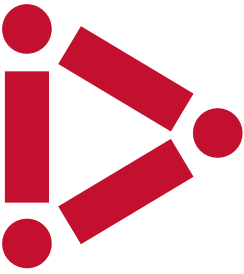
- The date the student notified the student's home department at Carnegie Mellon University;
- The date the student notified the associate dean of the student's College at Carnegie Mellon University; or
- The date the student notified the Carnegie Mellon University Dean of Student Affairs.

If the student does not notify Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is:

- The midpoint of the relevant semester in which the student withdraws or takes a leave of absence;
- The last date the student attended an academically-related activity such as an exam, tutorial or study group, or the last day the student turned in a class assignment.

#### **REFUND POLICY**

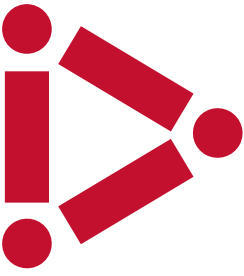
- A. Refunds in General. Students who withdraw from the Program or take a leave of absence after having paid the current semester's tuition and fees or receiving financial aid are subject to the following refund and repayment policies. No other charges are refundable.
- B. Exit Counseling. All borrowers of Federal student loans must complete a Federally mandated exit counseling session when graduating or dropping to less than half-time enrollment status, including by withdrawing or taking a leave of absence. Exit counseling prepares students for repayment. Students must complete an exit counseling session in its entirety, with complete and correct information; otherwise, the student's degree, diploma and official transcripts may be withheld. Information about exit counseling sessions can be found on



Carnegie Mellon University's website at

<https://www.cmu.edu/sfs/financial-aid/exit-counseling.html>.

- C. Withdrawals/Leaves On or Before 10th Class Day (during the Cancellation Period). Students who withdraw or take a leave of absence on or before the 10th class day of the relevant semester will receive a refund of 100% of tuition and fees (excluding any Application Fee or Registration Fee and Enrollment Deposit).
- D. Withdrawals/Leaves after 10th Class Day (after the Cancellation Period). Students who withdraw or take a leave of absence after the 10th class day of the relevant semester but before completing 60% of the semester will be assessed tuition based on the number of days completed within the semester. This includes calendar days, class and non-class days, from the first day of classes to the last day of final exams. Breaks which last five days or longer, including the preceding and subsequent weekends, are not counted. Thanksgiving and Spring Break are not counted. STRF will be adjusted accordingly with any adjustment of tuition. There is no tuition adjustment after 60% of the semester is completed. There is no refund of University fees after the 10th class day of the relevant semester.
- E. Repayment to Lenders/Third Parties. If any portion of refundable tuition and/or fees was paid from the proceeds of a loan or third party, the refund may be sent to the lender, third party or, if appropriate, to the Federal or state agency that guaranteed or reinsured the loan, as required by law and/or Carnegie Mellon University policy. Any amount of the refund in excess of the unpaid balance of the loan shall be first used to repay any student financial aid programs from



which the student received benefits, in proportion to the amount of the benefits received, and any remaining amount shall be paid to the student.

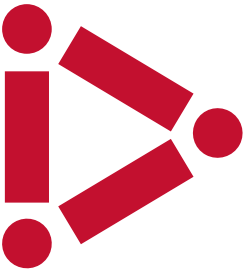
- F. Responsibility for Loan. If the student obtains a loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If the student has received Federal student financial aid funds, the student is entitled to a refund of moneys not paid from Federal student financial aid program funds. If the student is eligible for a loan guaranteed by the Federal or state government and the student defaults on the loan, both of the following may occur: 1) The Federal or state government or a loan guarantee agency may take action against the student, including applying any income tax refund to which the person is entitled to reduce the balance owed on the loan. 2) The student may not be eligible for any other Federal student financial aid at another institution or other government assistance until the loan is repaid.

## **PROBATION & DISMISSAL POLICIES**

University Policy: <http://www.cmu.edu/policies/student-and-student-life/suspension-required-withdrawal-policy.html>

### **Policy Statement**

University Suspension is a forced, temporary leave from the university. There are three types of suspension for students that apply to both graduate and undergraduate students:



*Academic Suspension* is the result of poor academic performance or violation of academic regulations and is imposed by the student's college or academic department (see university and college academic policies). *Disciplinary Suspension* is the result of serious personal misconduct and is imposed by the Office of Student Affairs (see The Word/Student Handbook).

*Administrative Suspension* is the result of failure to meet university financial obligations or failure to comply with federal, state or local health regulations and is imposed by Enrollment Services. (See Student Accounts Receivable Collection Policy and Procedures for financial obligations. Contact Student Health Services for information about health regulations.)

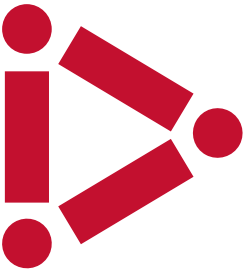
Suspended students may not:

- register for courses
- attend classes
- live in student or fraternity/sorority housing
- use campus facilities, including athletic facilities, library and computer clusters
- participate in student activities
- be members of student organizations
- have student jobs

(Note: students on academic suspension may have a summer campus job if they accepted the job before they were suspended.)

## **Employment**

Although suspended students may not hold student jobs, students on academic suspension may, under certain circumstances, have a non-student job with the university; students on disciplinary or administrative suspension may not.



To have a non-student job, students on academic suspension must receive approval from their associate dean (undergraduate students) or department head (graduate students) to ensure that the job will not violate their suspension terms. Students in violation of this will lose their degree student status, meaning they would have to reapply for admission to Carnegie Mellon through either Undergraduate Admission or the appropriate graduate department.

### **Transfer Credit**

Suspended students may take courses elsewhere; however, they may receive transfer credit only if their college's and department's policies allow this.

### **Appeals**

To appeal any action of this policy, the student may write to the following people:

*Academic Suspension* - associate dean (undergraduate students) or department head (graduate students);

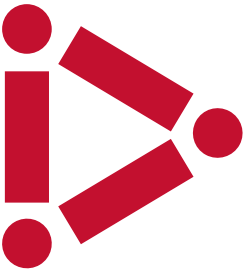
*Disciplinary Suspension* - dean of student affairs;

*Administrative Suspension* - vice president for enrollment, vice president for business and planning, and the dean of student affairs, in consultation with the student's associate dean.

### **Returning from Suspension**

In order to return from a suspension, a student must have the following approval:

*Academic Suspension* - associate dean (undergraduate students) or department head (graduate students);



*Disciplinary Suspension* - dean of student affairs;

*Administrative Suspension* - vice president for campus affairs or his designate.

## **ATTENDANCE & RESIDENCY POLICIES**

### **Class Attendance**

Students are expected to attend all classes outlined in a course syllabus as part of their Integrated Innovation Institute degree. All absences must be approved and arranged with the course professor on an individual basis. Please note that the Integrated Innovation Institute does not support excessive course absences for job interviewing and networking events. Excessive course absences may influence a student's ability to pass a course and/or complete their degree.

### **LEAVE OF ABSENCE**

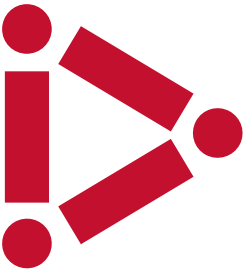
University Policy: <https://www.cmu.edu/policies/student-and-student-life/student-leave.html>

### **Policy Statement**

Students must sometimes interrupt their studies for a variety of reasons (financial, academic or personal). Students choosing to take a leave of absence must first contact their department advisor to discuss their plans while on leave to work out any conditions that may be necessary for a smooth return to Carnegie Mellon.

A student may leave Carnegie Mellon by either withdrawing from the university (this means leaving the university with no intention of returning) or by taking a leave of absence (this means leaving the university temporarily, with the firm and stated intention of returning).





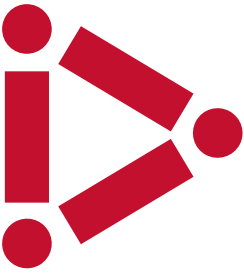
A Leave of Absence Form must be completed by all students requesting a leave of absence. A Withdrawal Form must be completed by all students who are withdrawing. Notifying instructors or no longer attending classes does not complete the process. Forms are available on [The HUB website](#). Not completing the leave form results in tuition being charged to midpoint of the semester or the last date the student attended an academically-related activity such as an exam, tutorial or study group, or the last day a student turned in a class assignment.

Students are required to fill out all information on the form, including all comment sections relating to reasons for their leave of absence. After completion of the form, students must take it to their home department and dean's office for appropriate signatures. The process of taking a leave will not be complete until all necessary signatures are on the leave form. Under certain circumstances, students may also need the Dean of Student Affairs to sign off on the leave form. International students who are here on a F1 or J1 visa must consult the Office of International Education for information on possible visa implications prior to going on leave.

Students on leave are not permitted to live in university housing, attend classes or maintain employment as students at Carnegie Mellon while their leave is in effect.

Doctoral candidates in ABD (All But Dissertation) status who wish to take a leave of absence should refer to the Doctoral Student Status policy.

Leaves during the academic semester will take effect as of the date signed by the student's dean. After the Leave of Absence or Withdrawal Form is received by the University's Registrar's Office, it will be reviewed for the appropriate tuition refunds (see Enrollment Services: Tuition and Fees Adjustment Policy) and grade implications. The recording of student



courses and grades for taking a leave in a semester follows the deadlines for semester or mini courses, as follows:

- On or before the university deadline to drop classes with W (withdrawal) grades: all courses or grades are removed.
- After the university deadline to drop classes but before the last day of classes: W (withdrawal) grades will be assigned to all classes. (W grades apply to all undergraduate students, and graduate students in the Carnegie Institute of Technology, the Mellon College of Science or the Tepper School of Business.)
- After the last day of classes: Permanent grades assigned by the instructor will be recorded.

Procedural Steps for Student Leaves can be viewed here:

<https://www.cmu.edu/hub/registrar/leaves-and-withdrawals/index.html>

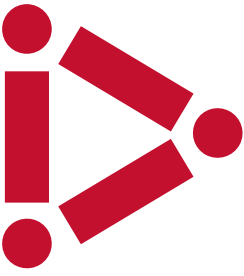
### **LOCAL HOUSING**

The CMU campus in Silicon Valley does not offer on-campus housing or off-campus housing services. Students need to find their own housing. There are many apartment complexes and/or room rentals within a commutable distance from the campus. Housing costs vary and most students choose to have roommates. [View a range of housing prices in the Mountain View area.](#)

While our student affairs office cannot act as a real estate agency or rental broker for you, we are happy to offer our advice or suggestions on locations that may be of interest to you. For questions, please contact the Assistant Dean of Student Affairs at [student-services@sv.cmu.edu](mailto:student-services@sv.cmu.edu).

### **STUDENT RECORD RETENTION POLICY**

University Policy: <https://www.cmu.edu/es/docs/record-retention-policy.pdf>



The policy of Carnegie Mellon University is to ensure the safety, accessibility, confidentiality, and good condition of the permanent record of every Carnegie Mellon student, past and present.

Carnegie Mellon University (CMU), established in 1900, holds all permanent records of our students (current and former) in the University Registrar's Office. We maintain original paper records in an offsite secure climate-controlled underground storage facility along with a microfilmed copy of each record. In addition, a copy of microfilmed records also resides in the University Registrar's Office in Pittsburgh, PA. This includes all students globally, include those students studying at our California teaching location and instructional sites. CMU has established the University Registrar's Office as the official data steward of all student records.

#### Historical Records 1906-1989

For every student enrolled at Carnegie Mellon University as a new or continuing student prior to the fall semester, 1989, and dating back to 1906, the University Registrar's Office of Carnegie Mellon University maintains a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not within the student's official transcript. The official transcript provides brief personal information to identify the student as unique. It contains courses, units and grades; semester and cumulative grade point averages; all degrees earned; transfer credit or advanced placement and dean's list indications.

The University Registrar's Office has established and maintains within a microfiche copy of good, readable, and reproducible quality of the student's permanent record in a secured records unit. A secondary permanent microfilm copy of all records will be maintained in good



condition in the climate-controlled, fire-proof, limited-access security at an offsite facility.

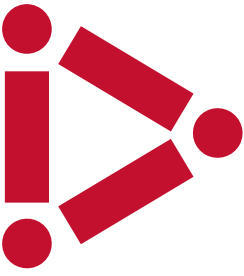
#### Modern Records 1989-Current

For every student enrolling at Carnegie Mellon University as a new or continuing student beginning in fall semester, 1989, the University Registrar's Office of Carnegie Mellon University will establish and maintain within an electronic data file in the University Student Services Suite (S3, our student information system) a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not. The University Registrar's Office staff will, under the direction of the University Registrar, add to the electronic record such new information as pertains to the student's demographic and academic record as it becomes available, semester-by-semester, and as the student progresses in his/her career at Carnegie Mellon University.

Daily, the Carnegie Mellon University Computing Services Division will perform a backup of all databases that have been altered during that day. Weekly, the Computing Services Division will perform a complete backup of all records within the student data file. The Computing Services Division staff will store the daily backups in the climate-controlled, fire-proof, limited-access security facility in the Computer Operations center in Cyert Hall on the Carnegie Mellon University campus. Upon successful completion of the monthly backup, the Computing Services Division staff will securely transfer the weekly and monthly backups from the preceding month to climate-controlled, fire-proof, secured vault at an offsite facility.

#### Cessation of Operations

In the unlikely event that CMU (which has existed for more than 100 years) ceases to exist, it will make appropriate arrangements to comply with clauses (1) and (2) for all its students consistent with the Commonwealth of Pennsylvania statutes and law. I have an informal plan and agreement with the University of Pittsburgh's University Registrar's



Office, that should either school cease, we would exchange student records.

### **STUDENT RIGHTS**

University Policy: <https://www.cmu.edu/policies/student-and-student-life/students-rights.html>

#### **Statement**

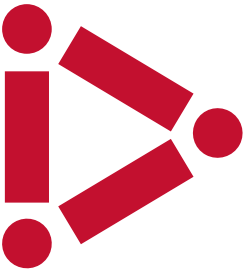
The primary right of students is to pursue their education so long as they maintain their eligibility to remain a member of the community by meeting its academic standards and so long as they observe the regulations imposed by the university for the governance of the academic community.

The second right of students is to be recognized as members of the student body, with all the privileges pursuant thereto as to use of physical plant, university services and facilities.

Every student has the constitutional rights and responsibilities of any citizen under the law. Conversely, a responsibility of any student is to respect these rights of any other member of the university community.

A student has the right to expect that academic and professional processes should be flexible and periodically open to review and to participate constructively with faculty and administration in those processes by which the university community maintains the excellence of the standards of its curriculum and methods of instruction and the viability of its total educational program.

The student has the right to recourse through the procedures outlined in The Word/Student Handbook against unreasonable academic action.



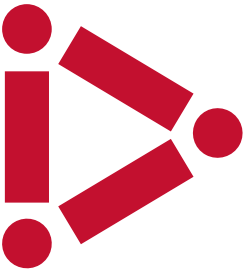
## Summary of Graduate Student Appeal and Grievance Procedures

University Policy: <https://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>

### Introduction

Set forth below is a summary of the processes available to graduate students who seek review of academic and non-academic issues. Generally, graduate students are expected to seek informal resolution of all concerns within the applicable department, unit or program before invoking formal processes. When an informal resolution cannot be reached, however, a graduate student who seeks further review of the matter is to follow these formal procedures. To the extent that these processes are set forth in official University policies, links to those statements of policy and more detailed description of processes and procedures are included. Where a graduate student's concerns implicate multiple policies or processes, the University reserves the right to decide which process shall apply in order to avoid duplicative and potentially conflicting processes and decisions, or in appropriate circumstances, the order in which multiple reviews may occur.

These appeal and grievance procedures shall apply to students in all graduate programs of the University. Students should refer to the online handbooks (or hard copy handbooks if applicable) for their particular programs for more detailed information about the administration and academic policies of the program. To the extent that these policies conflict in any way with policies, processes and procedures adopted at the College, Department or Program level, the policies set forth herein shall govern.

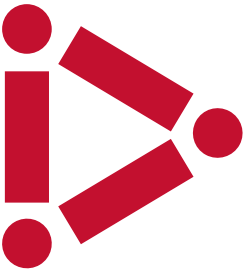


### **Appealing Final Grades**

Final grades will be changed only in exceptional circumstances and only with the approval of the instructor and the department, unit or program. Grading is a matter of sound discretion of the instructor and final grades are rarely changed without the consent of the instructor who assigned the grade. The following circumstances are the unusual exceptions that may warrant a grade appeal: (a) the final grade assigned for a course is based on manifest error (e.g. a clear error such as arithmetic error in computing a grade or failure to grade one of the answers on an exam), or (b) the faculty or staff member who assigned the grade did so in violation of a University policy. A graduate student who believes a final grade was assigned pursuant to (a) or (b) above should first present the case informally to the faculty or staff member responsible for the course in which the student believes an inappropriate grade has been awarded. If the student is not satisfied with the resolution at this first step, the student shall submit a formal, written appeal, with appropriate documentation, within the first fourteen (14) days of the semester following the awarding of the final grade under challenge, to the head of the department in which the course was offered. The department head (or the program head if the department head chooses to delegate the decision to him/her) will issue a written decision on the appeal within 30 days, or as soon thereafter as practical. If the student is not satisfied with the decision of the department head (or program head), the student may submit a formal, written appeal, with appropriate documentation, within seven (7) days to the Dean of the college in which the course is offered. The Dean shall render a decision within 30 days, or as soon thereafter as practical. The decision of the Dean shall be final and not appealable.

### **Summary of Levels of Appeal for Final Grades:**

- Informal discussion with the faculty member
- Formal written appeal to the department head (or the program head if the department head chooses to delegate the decision to him/her)



- Formal written appeal to the Dean
- Dean issues final non-appealable decision

See also [Carnegie Mellon University Grading Policies](#)

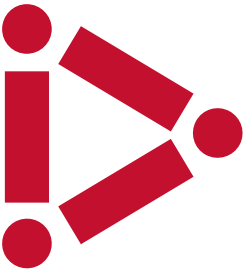
### **Appeal of Academic Actions**

An "Academic Action" is an action by a program, unit or department based on a graduate student's academic performance or failure to satisfy academic program requirements. Examples of Academic Actions include, but are not limited to, academic probation, academic suspension, and dismissal/drop. Each college, department, or program may set its own academic requirements and standards for acceptable academic performance. These standards and benchmarks for performance are set forth in the online and/or hard copy handbooks for individual graduate programs.

Graduate students will be notified of an academic action in writing by the applicable department, unit, or program head or director, or designated committee. Graduate students are encouraged to seek informal resolution of any concerns related to academic actions informally within the department, unit or program before filing a formal appeal.

Graduate students who wish to appeal an Academic Action must submit a formal, written appeal, with appropriate documentation, to the Dean of the College within seven (7) calendar days after receipt of written notice of the academic action by the department, unit, or program head or director, or designated committee. The Dean may delegate review of the matter to another individual or committee, including but not limited to one of the Associate Deans, the College Council or a specially constituted grievance committee who shall make a recommendation to the Dean. The Dean shall render a decision on the appeal within thirty (30) days or as soon thereafter as practical.





Graduate students who wish to appeal the written decision of the Dean must submit a formal written appeal, with appropriate documentation, to the Provost within fourteen (14) calendar days after receipt of the Dean's decision. A copy of the appeal must also be submitted to the Assistant Vice Provost for Graduate Education and to the Dean. The Provost may delegate review of the matter to another individual or committee, including but not limited to the Vice Provost for Education who shall make a recommendation to the Provost. The Provost shall render a decision on the appeal within thirty (30) days or as soon thereafter as practical. Decisions by the Provost are final and not appealable.

Generally, sanctions resulting from an Academic Action (e.g. probation, suspension, or dismissal /drop) take effect immediately, regardless of whether an appeal is filed. In exceptional circumstances, however, the appropriate Dean or the Provost may elect to hold sanctions in abeyance pending the resolution of an appeal.

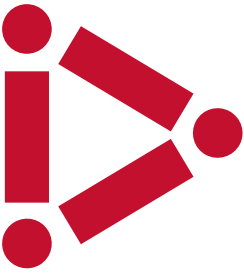
#### **Summary of Levels of Appeal for Academic Actions:**

- Seek informal resolution within department, unit, or program
- Formal written appeal to the Dean
- Decision rendered by the Dean
- Formal written appeal to the Provost
- Provost issues final non-appealable decision

#### **Appeal from Academic Disciplinary Actions**

"Academic Disciplinary Action" refers to penalties or sanctions imposed for violation of academic policies against cheating, plagiarism or unauthorized assistance as defined by the University's official [Policy on Academic Integrity](#).

The procedures for appeal from an Academic Disciplinary Action are set forth in the University's official policy on Academic Disciplinary Actions for Graduate Students. Graduate students who wish to appeal an



Academic Disciplinary Action must state in writing to the Provost their intention to do so within seven (7) calendar days after the date on which the penalty is communicated to the student (the "penalty date"), and then must present their written appeal with appropriate documentation to the Provost no later than fourteen (14) calendar days after said penalty date. The Provost will then take action on the appeal. Graduate students who wish to appeal the Provost's decision must state in writing to the President their intention to do so within seven (7) calendar days of the decision of the Provost. For more details, please review the policy and procedures on [Academic Disciplinary Actions for Graduate Students](#).

Generally, sanctions resulting from an Academic Disciplinary Action take effect immediately, regardless of whether an appeal is filed. In exceptional circumstances, however, the appropriate Dean or the Provost may elect to hold sanctions in abeyance pending the resolution of an appeal.

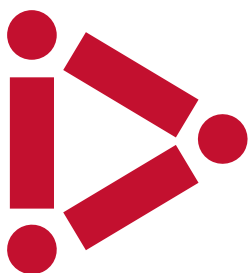
#### **Summary of Levels of Appeal for Academic Disciplinary Actions:**

- Academic disciplinary penalty imposed by faculty and/or department
- Formal written appeal to the Provost
  - Provost issues decision
- Formal written appeal to the President (when policy permits)
  - President issues final non-appealable decision

#### **Community Standards Violations**

As members of the University community, Carnegie Mellon students are expected to respect the rights of all students, faculty and staff and adhere to the policies outlined in the Student Handbook contained in [The Word](#), the [University Policies website](#), and any applicable college, department or graduate program handbooks.

If a student has observed a violation of university policy or law, or feels harmed by another student's misconduct (e.g. affecting his/her welfare,



property, safety or security) he/she should file a report with the Dean of Student Affairs and/or University Police as appropriate.

The procedures for adjudicating community standards violations and for appealing the results are available in [The Word](#) under [Community Standards](#).

For more information about community standards and disciplinary procedures, please visit the [Community Standards website](#).

### **Summary of Levels of Appeal for Community Standards Violations:**

#### **Harassment**

Carnegie Mellon is firmly committed to intellectual honesty, freedom of inquiry and expression and respect for the dignity of each individual. Acts of harassment or intimidation by a student toward any member of the campus community will not be tolerated. Graduate students with concerns or grievances related to harassment or intimidation by another student should contact the Dean of Student Affairs for resolution. Acts of harassment or intimidation by a student may be referred to the University Committee on Discipline. Graduate Students with concerns or grievances related to alleged harassment or intimidation by a staff member, faculty member or other member of the campus community should contact the University Ombudsman (412) 268-1018 for resolution.

#### **Sexual Harassment and Sexual Assault**

Graduate student grievances or concerns relating to sexual harassment will be handled according to the University's Policy against Sexual Harassment and Sexual Assault. Any member of the university community, whether faculty member, student, or staff member, who believes she or he has been the victim of sexual harassment and/or sexual assault or is aware of such conduct, is encouraged to make



contact with any of the individuals identified in the [Policy against Sexual Harassment and Sexual Assault](#) under Resources: People Who Handle Complaints and Oversee Compliance with this Policy and in the appendices. They will make certain that your complaint is communicated to the appropriate resource for handling.

### **Intellectual Property Disputes**

Disputes concerning rights to intellectual property must be resolved according to the procedures set forth in the University's [Intellectual Property Policy](#).

### **Research Misconduct**

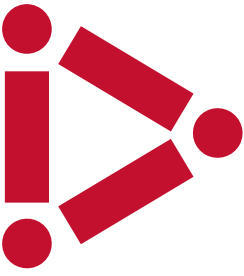
Carnegie Mellon University is responsible for the integrity of research conducted at the University. As a community of scholars, in which truth and integrity are fundamental, the University has established procedures for the investigation of allegations of misconduct of research with due care to protect the rights of those accused, those making the allegations, and the University. The procedures for handling allegations of research misconduct are set forth in the [Policy for Handling Alleged Misconduct in Research](#) at Carnegie Mellon University.

For graduate students found responsible for research misconduct, the President of the University may impose specific sanctions up to and including expulsion. The imposition of sanctions is subject to the procedures for approval and/or appeal prescribed for community standards violations, available at <https://www.cmu.edu/student-affairs/theword/community-standards/index.html>

### **Return from Leave of Absence**

Graduate students who wish to return to Carnegie Mellon following a leave of absence must follow the procedures set forth in the [Student Return Policy](#).

Generally, graduate students must negotiate their return to the University with their home academic department and follow any



applicable departmental policies. If a department chooses to deny a student's return from a leave of absence, the student may appeal to the Dean of the College.

### **Suspension/Required Withdrawal**

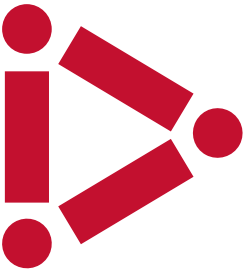
A University Suspension is a forced, temporary leave from the university. There are three types of suspension for students that apply to both graduate and undergraduate students:

- Academic Suspension is the result of poor academic performance or violation of academic regulations and is imposed by the student's college or academic department (see university and college academic policies).
- Disciplinary Suspension is the result of serious personal misconduct and is imposed by the Dean of Student Affairs (see [The Word/Student Handbook](#)).
- Administrative Suspension is the result of failure to meet university financial obligations or failure to comply with federal, state or local health regulations and is imposed by Enrollment Services. (See [Student Accounts Receivable Collection Policy and Procedures](#) for financial obligations. Contact [Student Health Services](#) for information about health regulations.)

Graduate students who wish to appeal a suspension or required withdrawal may write to the following individuals depending on the type of suspension:

- Academic Suspension – The applicable department, unit, or program head;
- Disciplinary Suspension – Dean of Student Affairs
- Administrative Suspension – Vice President for Enrollment, Vice President for Business and Planning, and the Dean of Student Affairs, in consultation with the student's Associate Dean

For more details see the [Student Suspension / Required Withdrawal Policy](#).



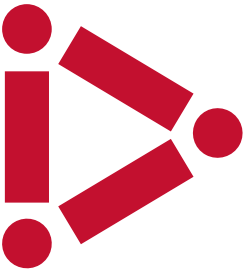
## General Grievances

The following grievance procedures are to be used for graduate student problems or concerns that are not covered by any of the policies or procedures set forth above. As such, these grievance procedures may not be used as a substitute for procedures contemplated under any other policy, including but not limited to, policies regarding academic actions; academic disciplinary actions; community standards; harassment; sexual harassment; intellectual property; research misconduct or any other policy.

Graduate students are expected to discuss any concerns or grievances initially with the faculty or staff member(s) involved. Students are strongly encouraged to seek informal resolution of grievances through consultations within the academic unit, department or program. Students may also seek assistance with the informal resolution of a grievance through the designated college ombudsperson or the Assistant Vice Provost for Graduate Education.

If a grievance cannot be resolved informally with the faculty or staff member involved within the academic department, a student may submit a formal, written grievance to the head of the department, unit or program. If there is more than one student with a grievance on a particular matter, each student must submit a separate grievance. The department, unit, or program head, or director or designated committee will issue a written decision on the grievance within thirty (30) days or as soon thereafter as practical.

Graduate students who wish to appeal from the decision rendered at the department, unit or program level must submit a formal, written appeal to the Dean of the College within seven (7) calendar days after receipt of written notice of the decision by the department, unit, or program head, or director or designated committee. The Dean may delegate review of



the matter to another individual or committee, including but not limited to one of the Associate Deans, the College Council or a specially constituted grievance committee who shall make a recommendation to the Dean. The Dean shall render a decision on the appeal within thirty (30) days or as soon thereafter as practical.

Graduate students who wish to appeal the written decision of the Dean must submit a formal written appeal to the Provost within seven (7) calendar days after receipt of the Dean's decision. A copy of the appeal must also be submitted to the Assistant Vice Provost for Graduate Education and to the Dean. The Provost may delegate review of the matter to another individual or committee, including but not limited to the Vice Provost for Education who shall make a recommendation to the Provost. The Provost shall render a decision on the appeal within thirty (30) days or as soon thereafter as practical. Decisions by the Provost are final and not appealable.

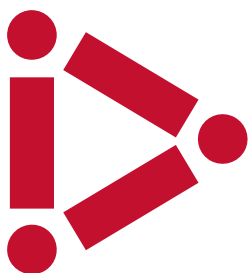
#### **Summary of Levels of Appeal for General Grievances:**

- Seek informal resolution within department, unit, or program
- Formal review by the appropriate department, unit, or program head, or director or designated committee.
- Formal written appeal to the Dean
- Formal written appeal to the Provost
- Provost issues final non-appealable decision

#### **DEGREE & DIPLOMA DISTRIBUTION PROCESS**

Based on the graduating semester, final diplomas are distributed to students through two channels – in person or direct mail. The full outline for this process and timeline for distribution can be reviewed here:

<https://www.cmu.edu/hub/registrar/graduation/diplomas/deadlines-and-distribution.html>



## COST OF ATTENDANCE

	# of Semesters	Entire Program	First Semester
MSSM (full time-12 month)	3	\$90,523	\$30,387
MSSM (full time- 16 month)	3	\$96,027	\$30,387
MSSM (part time local)	6	\$93,743	\$15,393
MSSM (part time remote)	6	\$92,705	\$15,215

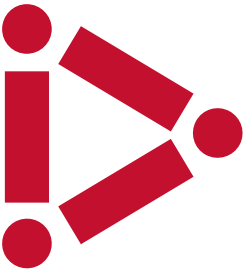
Additional details regarding cost of attendance per degree can viewed here: <https://www.cmu.edu/iii/degrees/admissions/cost.html>

## FINANCIAL ASSISTANCE

There is no university funding provided for students at the Integrated Innovation Institute. Teaching or research assistantships are available to Ph.D. students only. All enrolled students, or their employers, are responsible for payment in full for tuition and expenses. Some students do secure external funding. You are welcome to explore the HUB website for information about [graduate student financial aid](#), the [Office of Graduate Education](#) and the [College of Engineering websites](#) for external funding opportunities.

Meeting the cost of a graduate education is a significant investment. Carnegie Mellon University is committed to making it financially possible for graduate students to enhance educational development and reach their career goals. There are many financial aid resources available to students pursuing graduate studies at Carnegie Mellon University. Carnegie Mellon University participates in a number of Federal and state financial aid programs. Information about these financial aid programs can be found on Carnegie Mellon University's website, at <http://www.cmu.edu/finaid/index.html>





If you obtain a loan to pay for the MS in Software Management, you will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If you have received federal student financial aid funds, you are entitled to a refund of moneys not paid from federal student financial aid program funds.

Carnegie Mellon University does not have a pending petition in bankruptcy, is not operating as a debtor in possession, and has not filed a petition in bankruptcy within the preceding 5 years, nor has Carnegie Mellon had a petition in bankruptcy filed against it within the preceding 5 years that resulted in re-organization under Chapter 11 of the United States Bankruptcy Code.

### **Information about the Institution:**

#### Descriptions of Academic Programs

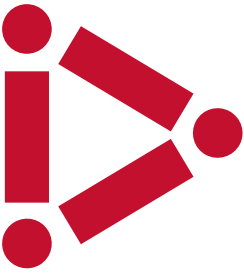
Information on the university's graduate academic programs and degree offerings is available from the various schools/colleges and admitting offices. Links to those programs can be found at <https://www.cmu.edu/academics/index.html>.

#### Faculty

Information on the university's faculty and instructional personnel is available from individual schools/colleges. This information can be found on the university's academics website at <https://www.cmu.edu/academics/index.html>.

#### Student Body Diversity

For Information about the diversity of the university student body, contact the Institutional Research and Analysis Office, <https://www.cmu.edu/ira/index.html>.



For information about the University's Diversity, Equity and Inclusion initiative, visit the Center for Student Diversity and Inclusion's website at <https://www.cmu.edu/student-diversity/>.

#### Gainful Employment Disclosures

As required by U.S. Department of Education regulations Gainful Employment Disclosures (Disclosures about CMU certificate programs that prepare students for specific occupations) can be found at <https://www.cmu.edu/hub/consumer-information/>.

### **Health and Safety**

#### Drug and Alcohol Abuse Prevention Program

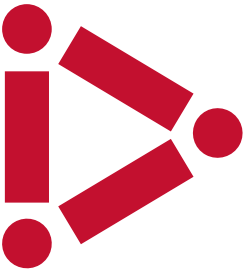
Under the Drug Free Workplace Act of 1988 and the Drug Free Schools and Campuses Act of 1989, the Carnegie Mellon University is required to have an alcohol and other drug policy outlining prevention, education and intervention efforts and consequences for policy violations. The policy can be found at <https://www.cmu.edu/policies/administrative-and-governance/alcohol-and-drug-policy.html>.

#### Vaccination Policies

- CMU-SV Prematriculation Immunization Policy can be found at <https://www.sv.cmu.edu/student-services/student-health.html>.
- CMU University Health Services Health Requirements for Incoming Students can be found at <https://www.cmu.edu/health-services/new-students/>.

#### Safeguarding Educational Equity / Sexual Misconduct Policy

The University prohibits sex-based discrimination, sexual harassment, sexual assault, dating/ domestic violence and stalking. The University



also prohibits retaliation against individuals who bring forward such concerns or allegations in good faith. The University's Sexual Misconduct Policy is available at <https://www.cmu.edu/policies/administrative-and-governance/sexual-misconduct/index.html>. The University's Policy Against Retaliation is available at <https://www.cmu.edu/policies/administrative-and-governance/whistleblower.html>. If you have been impacted by any of these issues, you are encouraged to make contact with any of the following resources:

- Office of Title IX Initiatives, <https://www.cmu.edu/title-ix/> 412-268-7125, [tix@cmu.edu](mailto:tix@cmu.edu)
- University Police, 412-268-2323

## **OFFICE OF STUDENT ASSISTANCE AND RELIEF**

The Office of Student Assistance and Relief is available to support prospective students, current students, or past students of private postsecondary educational institutions in making informed decisions, understanding their rights, and navigating available services and relief options. The office may be reached by calling (888) 370-7589, option #5, or by visiting [osar.bppe.gov](http://osar.bppe.gov)

## **STUDENT TUITION RECOVERY FUND**

The State of California established the Student Tuition Recovery Fund (STRF) to relieve or mitigate economic loss suffered by a student in an educational program at a qualifying institution, who is or was a California resident while enrolled, or was enrolled in a residency program, if the student enrolled in the institution, prepaid tuition, and suffered an economic loss. Unless relieved of the obligation to do so, you must pay the state-imposed assessment for the STRF, or it must be paid on your behalf, if you are a student in an educational program, who is a California



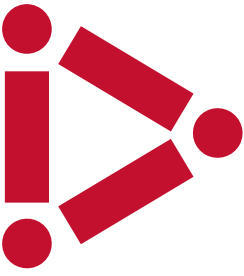
resident, or are enrolled in a residency program, and prepay all or part of your tuition.

You are not eligible for protection from the STRF and you are not required to pay the STRF assessment, if you are not a California resident, or are not enrolled in a residency program.

It is important that you keep copies of your enrollment agreement, financial aid documents, receipts, or any other information that documents the amount paid to the school. Questions regarding the STRF may be directed to the Bureau for Private Postsecondary Education, 1747 N. Market Blvd, Ste 225, Sacramento, CA 95834, (916) 574-8900 or (888) 370-7589.

To be eligible for STRF, you must be a California resident or are enrolled in a residency program, prepaid tuition, paid or deemed to have paid the STRF assessment, and suffered an economic loss as a result of any of the following:

1. The institution, a location of the institution, or an educational program offered by the institution was closed or discontinued, and you did not choose to participate in a teach-out plan approved by the Bureau or did not complete a chosen teach-out plan approved by the Bureau.
2. You were enrolled at an institution or a location of the institution within the 120 day period before the closure of the institution or location of the institution, or were enrolled in an educational program within the 120 day period before the program was discontinued.
3. You were enrolled at an institution or a location of the institution more than 120 days before the closure of the institution or location of the institution, in an educational program offered by the institution as to which the Bureau determined



there was a significant decline in the quality or value of the program more than 120 days before closure.

4. The institution has been ordered to pay a refund by the Bureau but has failed to do so.

5. The institution has failed to pay or reimburse loan proceeds under a federal student loan program as required by law, or has failed to pay or reimburse proceeds received by the institution in excess of tuition and other costs.

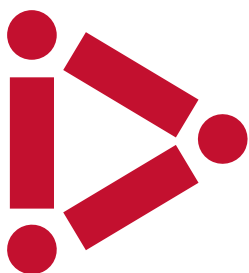
6. You have been awarded restitution, a refund, or other monetary award by an arbitrator or court, based on a violation of this chapter by an institution or representative of an institution, but have been unable to collect the award from the institution.

7. You sought legal counsel that resulted in the cancellation of one or more of your student loans and have an invoice for services rendered and evidence of the cancellation of the student loan or loans.

To qualify for STRF reimbursement, the application must be received within four (4) years from the date of the action or event that made the student eligible for recovery from STRF.

A student whose loan is revived by a loan holder or debt collector after a period of noncollection may, at any time, file a written application for recovery from STRF for the debt that would have otherwise been eligible for recovery. If it has been more than four (4) years since the action or event that made the student eligible, the student must have filed a written application for recovery within the original four (4) year period, unless the period has been extended by another act of law.

However, no claim can be paid to any student without a social security number or a taxpayer identification number.



## Other Information

### Section 1: Consumer Information

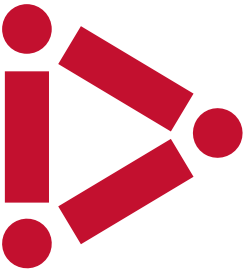
The Higher Education Opportunity Act (HEOA) was enacted on August 14, 2008, and reauthorized the Higher Education Act of 1965, as amended (HEA). These federal regulations govern the federal Title IV financial aid programs and include several student consumer information disclosure requirements as well as reporting requirements for institutions participating in the federal financial aid programs. This reporting ranges from general information about an institution, to its educational programs and services, to its policies, and student outcomes. Carnegie Mellon makes all required consumer information disclosures readily available, including through our website at <https://www.cmu.edu/hub/consumer-information/> and through individual notifications to students when required or upon request.

Additionally, parents and students are welcome to contact Lisa Krieg, Associate Vice President and Director of Enrollment Services, at [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu), for questions regarding any reporting area or to request a paper copy of the Student Consumer Information document.

### Section 2: Accreditation and Licensing of the Institution

Carnegie Mellon University is accredited through a voluntary, peer-review process coordinated by the Middle States Commission on Higher Education (MSCHE or Middle States). The aim of the accreditation process is to ensure current and future students and the public that the university is providing a high quality educational experience for students.

In the 2017-2018 academic year, a team of external reviewers from peer universities visited CMU to evaluate the university's educational and administrative activities. In preparation for that visit, CMU conducted a formal Self-Study (see <https://www.cmu.edu/middlestates/2018-self-study/index.html>) that engaged many faculty and staff from all over the university, in Pittsburgh and around the world.



Faculty and staff composing Self-Study Groups (see [https://www.cmu.edu/middlestates/2018-self\\_study/working-groups.html](https://www.cmu.edu/middlestates/2018-self_study/working-groups.html)) and the peer evaluation team (see [https://www.cmu.edu/middlestates/2018-self\\_study/peer-evaluation-team.html](https://www.cmu.edu/middlestates/2018-self_study/peer-evaluation-team.html)) often make suggestions or recommendations for improvement of CMU's activities and operations.

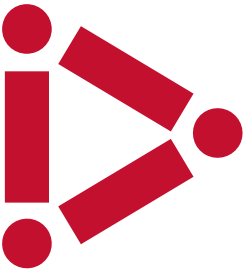
Please visit the pages within this site to learn more about accreditation standards and processes and to view the university's reaccreditation reports.

MSCHE is one of six regional accrediting agencies in the United States, each accrediting institutions of higher education within a specific geographic region. Middle States is recognized by the U.S. Department of Education. This recognition enables MSCHE's member institutions to establish eligibility to participate in federal financial aid programs (e.g., federal loans, grants, and work-study) administered by the U.S. Department of Education. Carnegie Mellon University has been accredited by Middle States since 1921.

The address and telephone number for the Middle States Commission on Higher Education is 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104, (267) 284-5000. To contact MSCHE by email, please use [info@msche.org](mailto:info@msche.org) or Spanish/Español [espanolinfo@msche.org](mailto:espanolinfo@msche.org).

The university's current "Statement of Accreditation Status" can be found at, <https://www.msche.org/institution/0476/>.

Inquiries regarding the University's accreditation status or authorization to operate in any of the above states may be directed to: Associate Vice President/Director of Enrollment Services, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone: 412.268.5399, email: [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu).



Carnegie Mellon University is licensed to operate in the states listed below. Individuals may contact the relevant agency for more information or information about how to file a complaint.

### **California**

Bureau for Private Postsecondary Education  
P.O. Box 980818  
West Sacramento, CA 95798-0818  
Telephone: 888-370-7589  
Email: [bppe@dca.ca.gov](mailto:bppe@dca.ca.gov)  
Website: [www.bppe.ca.gov](http://www.bppe.ca.gov)

### **New York**

New York State Education Department  
Office of Higher Education  
Room 977 Education Building Annex  
Albany, NY 12234  
Telephone: 518-486-3633  
Email: [hedepcom@nysed.gov](mailto:hedepcom@nysed.gov)  
Website: [www.highered.nysed.gov](http://www.highered.nysed.gov)

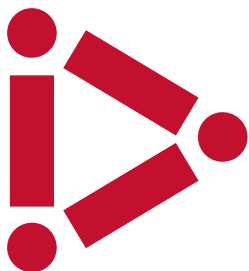
### **Pennsylvania**

Pennsylvania Department of Education  
Office of Postsecondary and Higher Education  
333 Market Street, 12th Floor  
Harrisburg, PA 17126-0333  
Telephone: 717-783-8228  
Email: [ra-collunivseminfo@pa.gov](mailto:ra-collunivseminfo@pa.gov)  
Website: [www.education.state.pa.us](http://www.education.state.pa.us)

### **Washington, D.C.**

Office of the State Superintendent of Education  
Government of the District of Columbia





810 First Street NE 9th Floor  
Washington, DC 20002  
Telephone: 202-727-6436  
Email: [osse@dc.gov](mailto:osse@dc.gov)  
Website: [osse.dc.gov](http://osse.dc.gov)

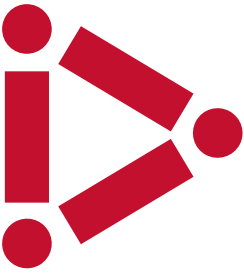
### **Section 3: Distance Education, State Authorization and Reciprocity Agreement (SARA)**

The State Authorization Reciprocity Agreement (SARA) is an agreement among member states, districts, and territories in the United States, which establishes national standards for interstate offering of postsecondary distance education courses and programs. It is intended to standardize the process of offering online courses and programs by postsecondary institutions located in states other than the state in which the enrolled student(s) are residing. SARA is overseen by a national council (NC-SARA) and administered by four regional education compacts.

Carnegie Mellon University has been approved by the Commonwealth of Pennsylvania to participate in NC-SARA and was accepted as a SARA institution on May 2, 2017; additionally, Carnegie Mellon secured approval through NC-SARA on May 18, 2017. Carnegie Mellon University is listed as an approved, participating institution on the NC-SARA website (<http://www.nc-sara.org/>). At this time, 49 of the 50 United States are SARA members. California is not a member of SARA; however, Carnegie Mellon is able to offer online education to California residents.

Except where prohibited by applicable law, students who reside outside of the United States generally are not restricted from enrolling in our online programs. Some online programs do require in-person attendance at one of Carnegie Mellon's teaching locations (e.g., Carnegie Mellon's Pittsburgh, Pennsylvania campus) for short portions of the program. Students interested in enrolling in a specific online program are encouraged to contact the person designated by the online program for questions about the program's requirements or enrollment.

### **Section 4: Student Complaints & Consumer Information by State**



Students should first attempt to handle complaints in consultation with their academic department and the university's Vice Provost for Education at [vpe@andrew.cmu.edu](mailto:vpe@andrew.cmu.edu). Unresolved complaints may be directed to the official complaint agency in the state or U.S. territory in which your state (or U.S. territory) is located. Through the university's participation in the State Authorization Reciprocity Agreement (SARA), you may access contact information for your state agency and instructions for filing complaints in your state using the SARA State Authorization Guide at <https://nc-sara.org/guide/state-authorization-guide>. If your state's complaint process is inadequate, complaints may be directed to the official complaint agency in the state or U.S. territory in which your CMU campus, additional location or other instructional site is.

### **Section 5: Professional Licensure Disclosures at the State Level**

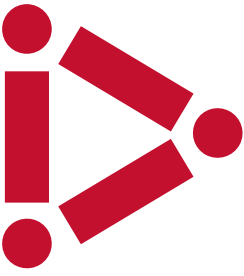
In accordance with Title 34 Code of Federal Regulations Part 668.43(a)(5)(v) regarding information educational institutions must make readily available to enrolled and prospective students, Carnegie Mellon is providing the following professional licensure/certification disclosures:

#### **School of Architecture**

The Bachelor of Architecture (B.Arch) and the Master of Architecture (M.Arch) degree programs are National Architecture Accrediting Board (NAAB)-accredited degree programs and meet the *educational requirements* for architectural licensure in all US States and the District of Columbia. Since each state has additional requirements for architectural licensure and those requirements vary among the states, students are advised to review the requirements for architectural licensure of the state in which they intend to obtain their license. The National Council of Architectural Registration Boards (NCARB) website at <https://www.ncarb.org/> and individual state architectural licensing board websites are good resources for researching additional architectural licensure requirements by state.

#### **School of Music, Teacher Education Certification**

Carnegie Mellon has determined that the Carnegie Mellon K-12 Music Education Certification program meets the *educational requirements* for educator licensure for instrumental, vocal, and general music (K-12) in the public schools of



Pennsylvania, but has not determined whether it meets the educational requirements for educator licensure in other states or the District of Columbia. Students should also be aware that each state also has additional educator licensure requirements and those requirements vary among the states. Students are advised to review the requirements for educator licensure of the state in which they intend to obtain their license prior to starting the academic program. Individual state educator licensing board websites are good resources for researching additional educator licensure requirements by state.

Pennsylvania also participates as a reciprocating state (see <https://www.ecs.org/teacher-license-reciprocity-state-profiles/>) which allows for educators holding an educator's license in one state to earn a license in another state, subject to meeting specific state specific requirements of the other state. Information about educator licensure in Pennsylvania may be found on the PA Department of Education Website at <https://www.education.pa.gov/Educators/Certification/Pages/default.aspx>.

#### College of Engineering, Undergraduate Degree Programs

Carnegie Mellon's engineering programs (Mechanical Engineering, Civil and Environmental Engineering, Chemical Engineering, Materials Science and Engineering, and Electrical and Computer Engineering) are accredited by the Engineering Accreditation Commission of ABET (see <https://www.abet.org/>). In order to obtain professional engineer licensure in any state, students must graduate from an ABET accredited program and meet testing and/or work experience requirements of the state in which they intend to obtain their license. Students are advised to review the requirements for professional engineer licensure of the state in which they intend to obtain their license. Information about professional engineer licensure in Pennsylvania may be found on the PA Department of State website at <https://www.dos.pa.gov/ProfessionalLicensing/BoardsCommissions/EngineersLandSurveyorsandGeologists/Pages/Engineer-Guide.aspx>.

The National Society of Professional Engineers website at



<https://www.nspe.org/resources/licensure/licensing-boards> and individual state professional engineer licensing board websites are good resources for researching additional professional engineer licensure requirements by state.

## Section 6: Educational Programs

### [Undergraduate & Graduate Programs](#)

Carnegie Mellon offers dozens of programs including undergraduate and graduate offerings. A full list of our Schools and Colleges can be found here, <https://www.cmu.edu/academics/index.html>.

Carnegie Mellon offers a broad range of academic programs that are carefully designed, regularly assessed, and iteratively improved by the faculty in the responsible academic unit(s). Our students' educational experiences are aligned with the University's mission and goals and support our core values as well as our commitment to excellence. We strive to offer an inclusive educational environment where students are supported to grow and thrive while preparing for their professional and personal post-graduate pursuits. The Vice Provost for Education has the responsibility to coordinate efforts, in partnership with the academic deans and associate deans, to assure processes for the development, review, and continuous improvement of all academic programs are in place and regularly conducted at the department, college and university levels. The Vice Provost for Education may be contacted at: [vpe@andrew.cmu.edu](mailto:vpe@andrew.cmu.edu).

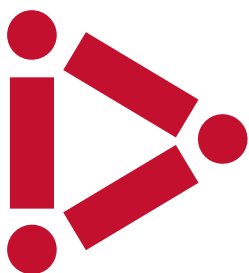
In addition to the link above, please visit our specific undergraduate and graduate websites:

Undergraduate Programs, <https://www.cmu.edu/admission/majors-programs>

Graduate Programs, <https://www.cmu.edu/graduate/academics/guide-to-graduate-degrees-and-programs/index.html>

## Section 7: Study Abroad

A student's enrollment in a program of study abroad approved for credit by Carnegie Mellon may be considered enrollment at CMU for purpose of applying for assistance under Title IV of the Higher Education Act (HEA) as amended. For more information



about study abroad and Coronavirus FAQs, please visit our website, <https://www.cmu.edu/oie/news-and-events/archives/2020-2021/covid/sab-and-coronavirus-faq.html>.

### **Section 8: CMU Faculty and Instructional Facilities**

Information about faculty and instructional facilities may be found on individual college/school websites via our website, <https://www.cmu.edu/academics/>.

### **Section 9: Articulation Agreements**

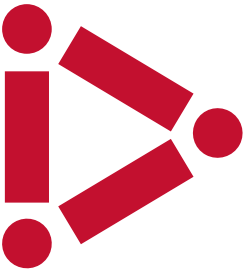
[Cross-College and University Registration PCHE \(Pittsburgh Council on Higher Education\)](#) Guidelines: Full-time Carnegie Mellon students may take courses for credit through the [Pittsburgh Council on Higher Education \(PCHE\)](#). This county-wide consortium of ten accredited member institutions permits the flow of students between institutions based on established protocols and agreements. Questions about Carnegie Mellon University's participation in PCHE may be directed to the University Registrar's Office at [uro-pche@andrew.cmu.edu](mailto:uro-pche@andrew.cmu.edu).

### **Section 10: Written Arrangements**

The Written Arrangements document on <https://www.cmu.edu/hub/consumer-information/docs/written-arrangement.pdf> provides information regarding written arrangements between Carnegie Mellon University (CMU) and any institution(s) that provides a portion of a CMU degree program to students enrolled at CMU. CMU enters into such agreements to enrich the educational experiences offered to its students.

### **Section 11: Student Location Determination**

Under the code of federal regulations (CFR) 600.9(c)(2)(iii) regarding state authorization requirements, an educational institution must make a determination regarding the state in which a student is located at the time of the student's initial enrollment in an educational program and, if applicable, upon formal receipt of information from the student, in accordance with the institution's procedures, that the student's location has changed to another state. Students are expected to review and update their off campus residence and their permanent address in Student Information Online (SIO) at the beginning of each academic year and when they change their local and/or permanent



addresses. For purposes of state authorization requirements, student location will be determined based on information in the Carnegie Mellon Student Information System (S3) in the following order:

1. Student's academic program code and;
2. Student's campus address, or;
3. Student's off-campus residence (if #1 and #2 cannot ascertain location) or;
4. Student's permanent address (if #1, #2, and #3 cannot ascertain location)

### **Section 12: Computing Services**

Information about Computing Services provides technology services as part of the Division of Operations. The Computing Services central IT department provides services that have strategic impact on university goals and may be accessed on our website, <https://www.cmu.edu/computing/>.

#### [Carnegie Mellon Computing Policy](#)

Carnegie Mellon computing and related policies are available on our website: <https://www.cmu.edu/policies/information-technology/computing.html>

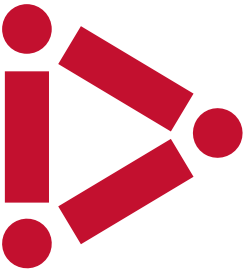
### **Section 13: Information Security Office (ISO)**

The Information Security Office is responsible for coordinating compliance with state, federal and international laws and regulations dealing with the security of Carnegie Mellon's information resources. This includes partnering with the Office of General Counsel and impacted business units to implement appropriate policies, procedures and controls to maintain compliance with legal requirements. More information is available on the ISO website, <https://www.cmu.edu/iso/compliance/index.html>.

### **Section 14: Copyright**

#### [Digital Copyright and DMCA](#)

Carnegie Mellon University takes copyright violation seriously. Besides raising awareness about copyright law, it takes appropriate action in support of enforcement as required by policy and law. United States [copyright law](#) (see <https://www.copyright.gov/>) "protects the original works of authorship fixed in any tangible medium of expression, from which they can be perceived,



reproduced, or otherwise communicated, either directly or with the aid of a machine or device".

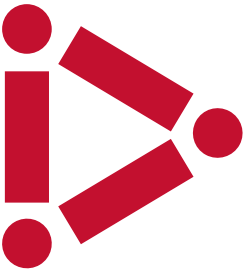
### Fair Use Policy

The University's Fair Use Policy states that all members of the University must comply with US copyright law and it explains the fair use standards for using and duplicating copyrighted material. In addition, the policy prohibits the duplication of software for multiple uses, meeting the Digital Millennium Copyright Act (DMCA) (see <https://www.copyright.gov/legislation/dmca.pdf>) requirements. The DMCA criminalizes the development or use of software that enables users to access material that is copyright protected. Furthermore, the Carnegie Mellon University Computing Policy (see <https://www.cmu.edu/policies/information-technology/computing.html>) prohibits the distribution of copyright protected material via the University network or computer systems, unless the copyright owner grants permission.

### Peer to Peer File Sharing

The Higher Education Opportunity Act of 2008 (Public Law 110-315) Section 488, requires institutions of higher education to annually inform students that "unauthorized distribution of copyrighted material, including unauthorized peer-to-peer file sharing, may subject the students to civil and criminal liabilities". Carnegie Mellon University does this by publication of a news article on Computing Services' website or via mass mail communication each semester. The law goes on to require institutions "to provide a summary of penalties for violation of Federal copyright laws, including disciplinary actions that are taken against students who engage in unauthorized distribution of copyrighted materials using the institution's information system." Copyright protected materials can include, but are not necessarily limited to:

- Music
- Movies or other videos
- Literary works



Software  
Digital images or libraries

### Penalties and Legal Actions

A user in violation of copyright law may face the following penalties:

- o Suspension from the university network as described under The University Processing of a DMCA Notice.
- o Prosecution in criminal court or a civil lawsuit seeking damages. Civil liability for copyright infringement can be as high as \$150,000 per instance of infringement in addition to legal fees. Criminal penalties for a first offense may be as high as five years in jail and a fine of \$500,000.
- o Disciplinary action taken by the Human Resources, the Office of General Counsel, or the Office of Community Standards and Integrity depending on the specific affiliation of the alleged infringer.

### Additional Information

Additional Information may be found on the following CMU web pages:

<https://library.cmu.edu/services/copyright>

<https://www.cmu.edu/c-cm/>

<https://www.cmu.edu/computing/>

## Section 15: Student Activities

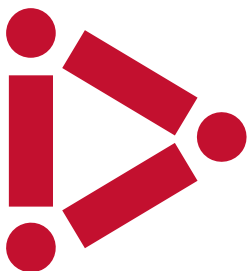
### Student Affairs

In depth information about CMU Student Affairs, including student activities and organizations, service and civic engagement, student government, diversity and inclusion, and how to get involved on campus is available on the CMU website, <https://www.cmu.edu/student-affairs/get-involved/index.html>.

### SLICE

The office of Student Leadership, Involvement and Civic Engagement (SLICE) website at <https://www.cmu.edu/student-affairs/slice/index.html> provides opportunities where undergraduate and graduate students can explore,





connect and engage with one another to create a set of experiences that match their unique interests and talents.

### The Center for Diversity and Inclusion

Information is available on the CMU website at <https://www.cmu.edu/student/diversity/>.

### Section 16: Cost of Attending the University

Information about tuition and fees as well as estimated costs for books, course materials, supplies, and equipment; housing and food; transportation; and personal/miscellaneous expenses are available on the Student Financial Services' website at <https://www.cmu.edu/sfs/tuition/index.html>.

### Section 17: Net Price Calculator

The Net Price Calculator is a tool that is intended for U.S. citizens, eligible non-citizens and permanent residents who plan on pursuing a full-time undergraduate degree but haven't yet applied to the university. This tool is a great way to start a conversation with your family about affordability as you conduct your college search. Carnegie Mellon offers the Net Price Calculator in partnership with the College Board to enable prospective students and their families to estimate financial aid eligibility. Before using the calculator, watch our Net Price Calculator tutorial video below for helpful tips.

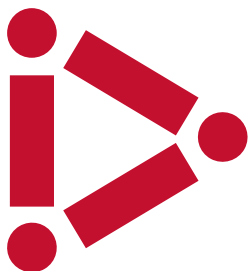
The video as well as other helpful information, are available on our website, <https://www.cmu.edu/admission/aid-affordability/net-price-calculator>.

### Section 18: College Navigator

The College Navigator website is a free consumer information tool designed to help students, parents, and others get information about thousands of U.S. postsecondary institutions--including Carnegie Mellon University--in the Department of Education's National Center for Education Statistics (NCES). College Navigator includes information on graduation and retention rates, academic programs, costs, financial aid, student loan defaults, etc. The College Navigator website is

<https://nces.ed.gov/collegenavigator/>.





## Section 19: Facilities & Services for Disabled Students

The Office of Disability Resources provides responsive and reasonable accommodations to students who self-identify as having a disability, including physical, sensory, cognitive and emotional disabilities. Students who want to learn more about the services and accommodations provided by the Office of Disability Resources, may visit <https://www.cmu.edu/disability-resources/students/>. Students may discuss accommodation needs by emailing [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) or calling 412-268-6121 to set up an appointment.

Students are also welcome to discuss concerns about support for disabilities with members of the admission staff, housing office and/or health/psychological services. Upon enrollment, students with disabilities should contact the Office of Disability Resources to discuss their needs and to develop a Student Individual Accommodation Plan. Accommodations are made with the intent to maintain the academic integrity of each course and the academic program as a whole, while also meeting assessed needs.

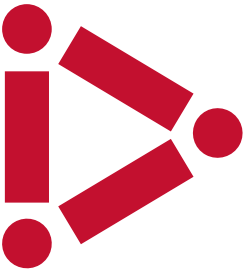
## Section 20: Student Privacy & FERPA

One of the most significant changes a parent or guardian experiences in sending a student to college is the difference in privacy standards for educational records. Carnegie Mellon values the student's right to privacy. The university adheres to a federal law called the Family Educational Rights and Privacy Act (also called FERPA or the Buckley Amendment) that sets privacy standards for student educational records and requires institutions to publish a compliance statement, including a statement of related institutional policies. For more detailed information, view the student privacy section of our website at <https://www.cmu.edu/hub/privacy/>

## Section 21: Student Information and Outcomes

[The Office of Institutional Analysis and Research \(IRandA\)](#)

The Office of Institutional Analysis operates under the leadership of the Office of the Vice Provost for Institutional Effectiveness and Planning (see [https://www.cmu.edu/iep\\_office/index.html](https://www.cmu.edu/iep_office/index.html)) provides the CMU community with



official information for use in external reporting and access to specific university datasets for internal analysis. More information about IRandA is available on our website, <https://www.cmu.edu/ira/index.html>.

#### Retention and Graduation Rates

Retention and graduation rates are available on the CMU website, [https://www.cmu.edu/ira/degrees-granted/graduation-and-retention-rates-by-cohort\\_11.4.2021.pdf](https://www.cmu.edu/ira/degrees-granted/graduation-and-retention-rates-by-cohort_11.4.2021.pdf) (scroll to bottom).

#### Enrollment Counts

CMU Enrollment Counts are available on the CMU website, <https://www.cmu.edu/ira/Enrollment/index.html>.

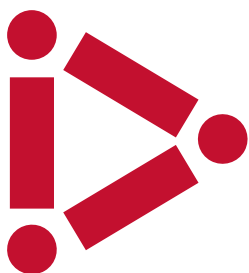
#### Integrated Postsecondary Education Data System (IPEDS)

IPEDS gathers information required under the Higher Education Act of 1965 as amended from colleges and institutions who participate in the federal student financial aid

programs. This information includes

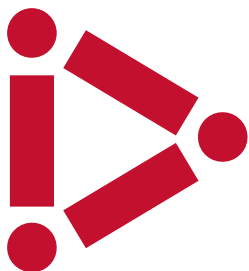
Information for Carnegie Mellon is available on the IPEDS website:

Category	Website
General Information	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#general">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#general</a>
Tuition, Fees & Estimated Student Expenses	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#expenses">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#expenses</a>
Financial Aid	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#finaid">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#finaid</a>



Net Price	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#netprc">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#netprc</a>
Enrollment	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#enrolmt">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#enrolmt</a>
Admissions	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#admsns">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#admsns</a>
Retention & Graduation Rates	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#retgrad">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#retgrad</a>

Outcome Measures	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#outcome">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#outcome</a>
Programs/Majors	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#programs">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#programs</a>
Service Members & Veterans	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#service">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#service</a>
Varsity Athletic Teams	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#sports">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#sports</a>
Accreditation	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#accred">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#accred</a>



Campus Security and Safety	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#crime">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#crime</a>
Cohort Default Rates	<a href="https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#fedloans">https://nces.ed.gov/collegenavigator/?q=Carnegie+Mellon&amp;s=all&amp;id=211440#fedloans</a>

### Common Data Set

The most recent information about Carnegie Mellon's common data set is available through our website, [https://www.cmu.edu/ira/CDS/cds\\_2122.html](https://www.cmu.edu/ira/CDS/cds_2122.html). Common data set includes:

[General Information](#)

[Enrollment and Persistence \(.pdf\)](#)

[First-Time, First-Year \(Freshman\) Admission \(.pdf\)](#)

[Transfer Admission \(.pdf\)](#)

[Academic Offerings and Policies \(.pdf\)](#)

[Student Life \(.pdf\)](#)

[Annual Expenses \(.pdf\)](#)

[Financial Aid \(.pdf\)](#)

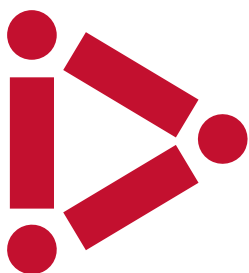
[Instructional Faculty and Class Size \(.pdf\)](#)

[Degrees Conferred \(.pdf\)](#)

## Section 22: Career & Job Placement

### Career & Job Placement Service

The Career and Professional Development Center (CPDC) is Carnegie Mellon University's centralized career services center providing a comprehensive range of services, programs and materials focusing on career exploration and decision making, professional development, experiential learning and employment assistance to meet today's evolving workplace and student goals of finding satisfying work! Information about the resources provided by CPDC is available on the CMU website, <https://www.cmu.edu/career/resource-library/index.html>.



### First Destination Career Outcomes

The Career and Professional Development Center (CPDC) surveys all students graduating from Carnegie Mellon University (excluding Heinz College and Tepper graduate students) in order to obtain information on their career plans after graduation, also known as **First Destination** Career Outcomes. Common points of data gathered from graduates include hiring companies, graduate and professional schools, starting salaries, and geographic locations. More information may be found on the CMU website, <https://www.cmu.edu/career/outcomes/post-grad-dashboard.html>.

## Section 23: Health and Safety

### Annual Security and Fire Safety Report

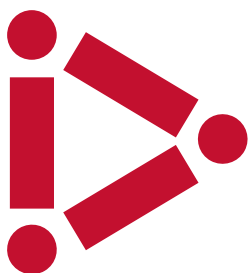
A copy of the most recent CMU Annual Security and Fire Safety Report is available on the CMU website at <https://www.cmu.edu/police/reports/fire-safety/2022asr.pdf>. Please see page 14 for Emergency Response and Evacuation Procedures. A printed copy of the report may be requested by contacting University Police at 412-268-6232 or [campuspd@andrew.cmu.edu](mailto:campuspd@andrew.cmu.edu).

Historical annual security and fire safety reports (Carnegie Mellon University Police Department Annual Reports) are also available online at <http://www.cmu.edu/police/annualreports/>.

### Alcohol and Drug Policy (Faculty, Staff, Students)

The University's Alcohol and Drug Policy, which includes information about health risks associated with drug and alcohol as well as resources for individuals who are experiencing substance use difficulties, is published on <https://www.cmu.edu/student-affairs/pdfs/2023-2024-alcohol-and-drug-guide.pdf>. The policy focuses on compliance with laws in the United States and the Commonwealth of Pennsylvania. However, as a global university with operations throughout the world, Carnegie Mellon is equally committed to compliance with all applicable alcohol and drug laws in all jurisdictions in which the university operates.

### Vaccination Policies



The university values personal and community health and recognizes the critical role that each individual plays in contributing to community health by participating in personal health care practices that prevent the spread of contagious diseases. Participation in a vaccination program represents one such highly effective personal health practice. CMU Prematriculation Immunization Policy is published on <http://www.cmu.edu/policies/student-and-student-life/immunizations.html>. COVID vaccine requirements change frequently. The most up-to-date information on COVID vaccination requirements is published on <https://www.cmu.edu/coronavirus/health-and-wellness/vaccines.html> and <https://www.cmu.edu/coronavirus/>. Immunization requirements for incoming students are published on <https://www.cmu.edu/health-services/new-students/>.

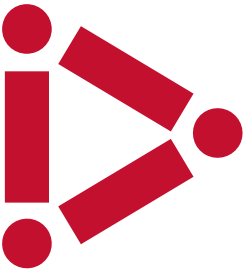
### Emergency Response Plan

The purpose of the Emergency Response Plan is to establish an organizational structure and procedures for response to major emergencies. It assigns the roles and responsibilities for the implementation of the plan during an emergency following the incident command system model. This plan has been prepared to address all types of emergencies affecting the Carnegie Mellon community in a coordinated and systematic manner. Carnegie Mellon University is committed to supporting the welfare of its students, faculty, staff and visitors. This plan is designed to maximize human safety and preservation of property, minimize danger, restore normal operations of the university, and assure responsive communication to all appropriate parties. See <https://www.cmu.edu/student-affairs/theword/community-policies/emergency-response-plan.html#scope> for more information.

### Section 24: Equity in Athletics

The Equity in Athletics Disclosure Act requires co-educational institutions of postsecondary education that participate in a Title IV, federal student financial assistance program, and have an intercollegiate athletic program, to prepare an annual report to the Department of Education on athletic participation, staffing, and revenues and expenses, by men's and women's teams.

### Statute and Regulations



The Higher Education Opportunity Act (Public Law 110-315) (HEOA) was enacted on August 14, 2008. This law reauthorizes and extends the Higher Education Act of 1965, as amended. The Higher Education Act (HEA) provides the statutory authority for most of the programs and activities administered or conducted by the Office of Postsecondary Education, including requirements related to equity in athletics disclosure.

### Annual Report

This information is available each November 1 at the U.S. Department of Education's website <https://ope.ed.gov/athletics/#>. To view the data, please select "Get data for one institution" (usually located on the right side of the page), enter "Carnegie Mellon University" in the "Name of Institution" field, and select the "Search" button at the bottom of the page. Select "Carnegie Mellon University" to view the institution's data.

A printed copy of the university's most recent report is available upon request by calling the Department of Athletics, Physical Education and Recreation at 412-268-8054 or by sending an email to [jcentor@andrew.cmu.edu](mailto:jcentor@andrew.cmu.edu).

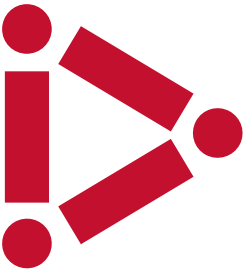
## Section 25: Textbook Information

### Bookstore

Required and recommended textbooks and supplemental course materials are available to purchase from the University Stores. Students can view and purchase their course materials by visiting the online bookstore at [https://bncvirtual.com/vb\\_home.php?FVCUSNO=37983&url=CarnegieMellon.htm](https://bncvirtual.com/vb_home.php?FVCUSNO=37983&url=CarnegieMellon.htm). To get started, students can visit the Textbooks FAQ at <https://bookstore.web.cmu.edu/SiteText?id=73594> for instructions on using the online bookstore site. The University Stores staff is happy to help with questions and can be reached by email at [books@andrew.cmu.edu](mailto:books@andrew.cmu.edu), by phone at 412-268-5591, or in-store.

### Textbook Provisions (Higher Education Opportunity Act 2008)





The Higher Education Opportunities Act (HEOA) of 2008 (see <https://www.congress.gov/bill/110th-congress/house-bill/4137>) outlines several provisions for publishers and higher education institutions related to textbooks and other course materials. According to the law, the language addressing textbooks is meant to “ensure that students have access to affordable course materials by decreasing costs to students and enhancing transparency and disclosure with respect to the selection, purchase, sale, and use of course materials (Sec. 133 a.)” Textbook consumer information requirements are provided on <https://www.cmu.edu/es/course-and-classroom/textbooks.html>.

## Section 26: Voter Registration

### Pennsylvania

- o **Pennsylvania Voter Registration** (see <https://www.pavoterservices.pa.gov/Pages/VoterRegistrationApplication.aspx>)
- o **Find Your PA Polling Place** (see <https://www.pavoterservices.pa.gov/pages/pollingplaceinfo.aspx>)

### California

- o **California Online Voter Registration** (see <https://registertovote.ca.gov/>)
- o **Find Your CA Polling Place** (see <https://www.sos.ca.gov/elections/polling-place>)

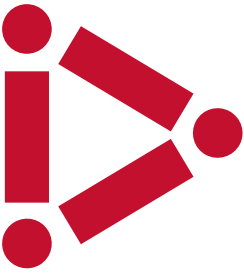
### New York

- o **New York Online Voter Registration** (see <https://www.elections.ny.gov/VotingRegister.html>)
- o **Find Your NY Polling Place** (see <https://voterlookup.elections.ny.gov/>)

### District of Columbia

- o **Washington DC Voter Registration** (see <https://vote.gov/register/dc/>)
- o **Find Your DC Polling Place** (see <https://www.dcboe.org/Voters/Where-to-Vote/Find-Out-Where-to-Vote> )

## Section 27: Tuition Adjustments/Withdrawals from the University Tuition Adjustments



If a student takes a leave of absence or withdraws within the first ten class days (fifteen calendar days) of a semester, tuition and fees are fully refundable, as indicated on the tuition adjustment schedule (see <https://www.cmu.edu/sfs/tuition/adjustment/index.html>). Students who take a leave of absence or withdraw from the university before completing 60% of the semester will be assessed tuition based on the number of days completed within the semester. This includes calendar days, class and non-class days, from the first day of classes to the last day of final exams. Breaks that last five days or longer, including the preceding and subsequent weekends, are not counted. Thanksgiving and Spring Break are not counted. There is no tuition adjustment after 60% of the semester is completed.

#### Official Date of Leave of Absence/Withdrawal

For students who notify the university of their intent to take a leave of absence or withdraw, the official date is the earliest of the:

- o Date the student began the withdrawal or leave of absence process;
- o Date the student notified his or her home department;
- o Date the student notified the associate dean of his or her college; or
- o Date the student notified the dean of students.

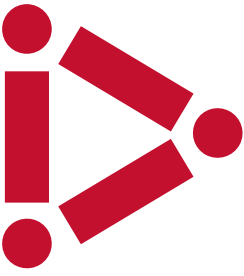
For students who do not notify the University of their intent to take a leave of absence or withdraw, the official date is:

- o The midpoint of the semester;
- o The last date the student attended an academic-related activity, such as an exam, tutorial or study group, or the last day a student turned in a class assignment.

Other important Information about tuition adjustments & withdrawals from the University as well as tuition adjustment schedules may be found on the following website: <https://www.cmu.edu/sfs/tuition/adjustment/index.html>.

#### Tepper Refund Policy Exception:

Tepper School graduate tuition is refunded 100% to students who withdraw by the course drop deadline. After the course drop deadline, tuition is non-refundable and remains charged at 100%. This tuition refund policy is separate from the calculation used to cancel and return federal loan funds when students withdraw.



## Section 28: Transfer of Credit Policy

The University's Transfer of Credit Policy is published on <https://www.cmu.edu/policies/student-and-student-life/transfer-credit-evaluation-and-assignment.html>.

Transfer credit is only accepted for courses taken at accredited institutions from which an official transcript is received. Transfer credits must meet the academic requirements of the program in which the student is enrolled and may not exceed the maximum number of transferrable units, per the program's academic requirements. Courses accepted for credit must have been taken for a letter grade and students must have earned a C (2.00) or above in the transferred course, however, transfer credits will only record the units/credits earned, **not** the grade, unless the course is taken at one of the [Cross Registration \(PCHE\)](#) affiliates. Carnegie Mellon does not award course credit for prior experience such as service in the armed forces, paid or unpaid employment, or other "real world" learning experiences or demonstrated competency. See additional information, <https://www.cmu.edu/hub/registrar/registration/transfer-transcripts.html> Departmental transfer credit processes may vary. Please review information on your college of school of interest websites through <https://www.cmu.edu/academics>.

## Section 29: Contact Information for Assistance in Obtaining Institutional or Financial Aid Information

### Current Undergraduate Students:

Student Financial Aid Office

*Mailing Address:* Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213

*Telephone:* 412-268-8186

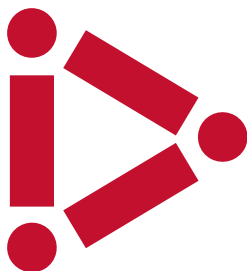
*Fax:* 412-268-8084

*Email:* [thehub@andrew.cmu.edu](mailto:thehub@andrew.cmu.edu)

*Website:* <https://www.cmu.edu/sfs/financial-aid/undergraduate/index.html>

### Prospective Undergraduate Students:

Student Financial Aid Office



*Mailing Address:* Office of Undergraduate Admission, Carnegie Mellon University,  
5000 Forbes Avenue, Pittsburgh, PA 15213

*Telephone:* 412-268-2082

*Fax:* 412-268-7838

*Email:* [admission@andrew.cmu.edu](mailto:admission@andrew.cmu.edu)

*Website:* <https://www.cmu.edu/admission/aid-affordability>

#### Current and Prospective Graduate Students:

Student Financial Aid Office

*Mailing Address:* Carnegie Mellon University, Student Financial Aid Office, 5000  
Forbes Avenue, Pittsburgh, PA 15213

*Telephone:* 412-268-8186

*Fax:* 412-268-8084

*Email:* [thehub@andrew.cmu.edu](mailto:thehub@andrew.cmu.edu)

*Website:* <https://www.cmu.edu/sfs/financial-aid/graduate/index.html>

### **Section 30: Types of Financial Aid**

There are various types of financial aid available for Carnegie Mellon students, including federal, state, and institutional. Understanding financial aid eligibility and the financial aid award letter will help students and families navigate financing decisions that need to be made while attending Carnegie Mellon. Visit our website at <https://www.cmu.edu/sfs/financial-aid/your-award/index.html> for help in understanding your financial aid awards.

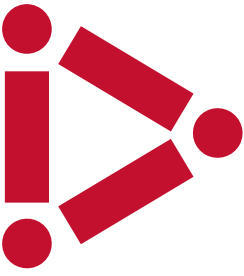
#### Undergraduate Grants

Grant assistance is awarded on the basis of demonstrated financial need. Students do not need to work for or repay grants. Grants are commonly referred to as "gift aid." More information may be found on our website, [https://www.cmu.edu/sfs/financial\\_aid/types/scholarships-and-grants/grants.html](https://www.cmu.edu/sfs/financial_aid/types/scholarships-and-grants/grants.html).

#### Federal Pell Grant

A Federal Pell Grant is awarded by the federal government to students with high financial need. Students who are eligible for a Federal Pell Grant after their aid





package is determined, will notice a dollar-for-dollar reduction to their Carnegie Mellon need based grant funds. More information can be found on the Department of Education website, <https://studentaid.gov/understand-aid/types/grants/PELL>.

#### Federal Supplemental Educational Opportunity Grant

A Federal Supplemental Educational Opportunity Grant (FSEOG) is for undergraduate students who have exceptional financial need. Carnegie Mellon usually awards these grants to students who receive a Federal Pell Grant. If there is a change in Federal SEOG eligibility, a dollar-for-dollar adjustment to the student's Carnegie Mellon need-based grant funds will occur. More information can be found on the Department of Education website, <https://studentaid.gov/understand-aid/types/grants/fseog>.

#### State Grants

Some states, including the state of Pennsylvania, provide educational grants to their residents who demonstrate need. View a list of participating states on <https://www.cmu.edu/sfs/financial-aid/types/scholarships-and-grants/state-grants.pdf>. Upon notification from any state agency of a student's eligibility, Carnegie Mellon will modify the student's financial aid package to reduce Carnegie Mellon need-based grant funds dollar-for-dollar.

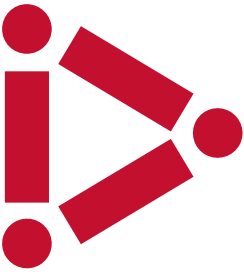
See the National Association of Student Financial Aid Administrators (NASFAA) website, [https://www.nasfaa.org/State\\_Financial\\_Aid\\_Programs](https://www.nasfaa.org/State_Financial_Aid_Programs), for more information on state grants.

[Graduate Scholarships, Grants, Stipends, Assistantships, Fellowships](#) Funding for graduate students may include scholarships, grants, stipends, assistantships, and fellowships. For information about these awards, contact the academic department you plan to attend. The department will be able to discuss the amounts and requirements for each type of funding.

#### Student Employment

There are three types of hourly student employment options available:

- o Federal Work-Study (FWS): Funding = 40% Federal / 60% Employer
- o Federal Community Service Work-Study (FCS): Funding = 70% Federal / 30% Employer



o **Non-Work-Study (NWS):** Funding = 100% Employer

Federal Work-Study (FWS) is a need-based self-help award. If a student has been awarded FWS, the FWS award is the total that can be earned during the academic year as a work-study student. It is important to note that funds earned in the Federal Work Study Program (including the Federal Community Service Work Study Program) are not credited to the student's account.

Students who do not have financial need or who have not applied for financial aid may find non-work-study job opportunities on campus.

More information about student employment is available on the following website:

· *FAQs:* <https://www.cmu.edu/sfs/student-employment/faq.html>

· *On Campus Employment for Students:* <https://www.cmu.edu/career/students-and-alumni/on-campus-employment/index.html>

· *Student Hourly Positions:* <https://www.cmu.edu/sfs/student-employment/hourly-positions.html>

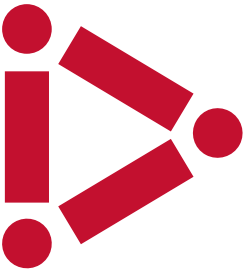
### Loans

Several types of loans are available to students who meet eligibility requirements. Information about federal, institutional, and private loans is available on <https://www.cmu.edu/sfs/financial-aid/types/index.html>. The site includes detailed information about loan terms and how to apply.

Note that the following disclosure is required for Carnegie Mellon students enrolled in California: If a student obtains a loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund (amount returned to the loan program, if any). If the student has received federal student financial aid funds, the student is entitled to a refund of the moneys not paid from federal student financial aid program funds. Learn more about student account refunds on our website, <https://www.cmu.edu/sfs/billing/refunds.html>.

### Federal Direct Student Loans

Federal Direct Student Loans are the most widely-used loan for college students. Eligibility is determined by completing the FAFSA. Types of Federal Direct



Loans include Federal Direct subsidized, unsubsidized, and Plus (for parents or graduate students). Detailed information about Federal Direct Student Loans is available on our website, <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/index.html>.

### Federal Loan Repayment

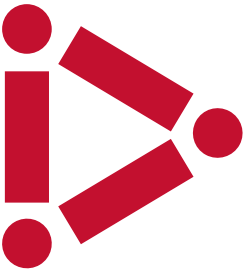
Federal student loans offer flexible repayment plans, loan consolidation, forgiveness programs, and more. View more information on [loan repayment options](https://studentaid.gov) on <https://studentaid.gov>, where you can find comprehensive information about your federal loans, including your loan amounts and balances, your loan servicer and contact information, your interest rates, your current loan status, guidance on loan repayment options, etc.

Repayment plans determine your monthly student loan payment amount, how many years it will take to pay back what you borrowed, and how much interest you will pay over the life of your loan. Keep in mind, the longer it takes to pay back your loan, the more interest will accrue and increase the overall cost of your loan. *Note that any private loans you have borrowed do not appear on studentaid.gov.*

### Federal Student Loan Entrance Counseling\*

All first-time Federal Direct Loan borrowers are required complete an online entrance counseling session after receipt of the financial aid award letter. The session provides information about borrower rights and responsibilities. CMU is notified when a student has completed entrance counseling. Students who have completed a federal entrance counseling session while at CMU, do not have to complete another one. You may view instructions on <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/mpn-entrance-counseling.html>.

**Student Rights and Responsibilities/Master Promissory Note (MPN)\*** All first-time Direct Loan borrowers are required to complete a Master Promissory Note (MPN). The MPN is a legal document in which you promise to repay your loan(s) and any accrued interest and fees to the U.S. Department of Education. It also explains the terms and conditions of your loan(s) and sample loan repayments. All student borrowers must read and understand their rights and responsibilities when choosing to borrow a federal loan.



The MPN is available on the U.S. Department of Education website, <https://studentaid.gov/mpn/>.

\*Loan funds will not disburse until both Entrance Counseling and the MPN are completed.

### Federal Loan Exit Counseling

Upon ceasing enrollment and prior to beginning loan repayment federal loan borrowers are required to complete an online exit counseling session. Federal loan exit counseling provides important information you need to prepare to repay your federal student loans. Topics include understanding your loans, plans for repayment, avoiding default, and making finances a priority. Exit counseling may be completed on the U.S. Department of Education website, <https://studentaid.gov/exit-counseling/>. See also the *Direct Loan Exit Counseling Guide* on <https://studentaid.gov/sites/default/files/exit-counseling.pdf>.

### Yeknik Student Loan

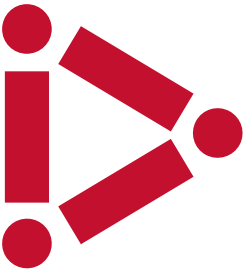
The Yeknik Student Loan Fund is endowed by Wayne M. and Nancy Yeknik. It is an institutional loan awarded to students who are sophomores, juniors, and seniors, have a cumulative 3.0 QPA, and have financial need. More information is available on our website, <https://www.cmu.edu/sfs/financial-aid/types/yeknik.html>.

### Private Education Loans

Private loans are a borrowing option for some students. Carnegie Mellon recommends that you review your federal, state, and institutional grants and loan options to compare borrower benefits and loan terms before opting to borrow a private education loan because the terms and conditions of federal student loans may be more favorable than those of private education loans.

Carnegie Mellon University does not endorse any lender. Carnegie Mellon uses a loan comparison tool called FastChoice (see, <https://choice.fastproducts.org/FastChoice/home/324200>) that is offered free-of charge to schools by the Great Lakes Higher Education Corporation. The lenders presented in FastChoice include lenders from whom our students have borrowed over the past two





years and who have demonstrated a high level of service or other benefit to our students. This list is updated annually and is not-all inclusive. Students should understand that they may choose any lender they wish (even those not presented in Fast Choice) without penalty or unnecessary delays.

#### Private Loan Self-Certification Form

Pursuant to Section 155 of the Higher Education Act of 1965, as amended, (HEA) and to satisfy the requirements of Section 128(e)(3) of the Truth in Lending Act, a lender must obtain a self-certification signed by the applicant before disbursing a private education loan. The school is required on request to provide this form or the required information only for students admitted or enrolled at the school. The Self Certification form is available through your lender and on our website at <https://www.cmu.edu/sfs/docs/private-loan-cert.pdf>. If the information needed to complete the form is not pre-filled on the form, you may access the information on your financial aid award letter from the school or by contacting the Student Financial Aid Office at [student-financial-aid@andrew.cmu.edu](mailto:student-financial-aid@andrew.cmu.edu).

#### Lender Relationship Code of Conduct

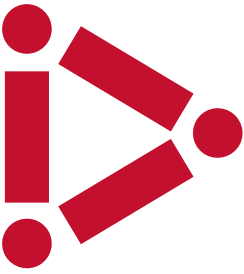
Carnegie Mellon officials are prohibited from accepting any financial or other benefits in exchange for displaying lenders and loan options in FastChoice. Our lender relationship code of conduct is published on <https://www.cmu.edu/sfs/docs/loans-code-of-conduct.pdf>.

### Section 31: Financial Aid Disbursements

Financial aid (including student loans) is disbursed one semester at a time based on the student's enrollment at the time of each disbursement. The Student Financial Aid Office begins to disburse aid to student accounts approximately 10 days before classes begin for students who have completed the necessary requirements.

#### Grants and Scholarships Disbursements

Grants and scholarships are determined by the Student Financial Aid Office and are applied directly to the student account on a semester basis to pay charges for tuition, fees and on-campus room and board (if applicable).



### Federal Loan Disbursements

First-time Federal Direct Loan borrowers are required to sign a Master Promissory Note and complete loan entrance counseling before loan funds are credited to the student account. After these loan requirements are completed (no sooner than 10 days prior to the start of the semester), federal loans are disbursed to the student account. Disbursements are made to the student account in two equal payments (unless the loan is for one semester) - one for each semester covered by the loan. It is very important to understand that before federal student loans disburse, loan proceeds are reduced by the federal origination fee (see <https://studentaid.gov/understand-aid/types/loans/interest-rates#fees>). Upon disbursement, actual amounts may be viewed by logging into Student Information Online (SIO) on <https://www.cmu.edu/hub/sio/about.html> and selecting "Student Account Activity" from the "Finances" menu.

View loan disbursement dates here: <https://www.cmu.edu/sfs/financial-aid/index.html#disbursement>

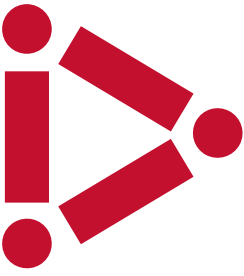
### Private Loan Disbursements

Generally, private loan disbursements occur at the beginning of each semester covered by the loan. Students should review their loan disclosures from their lender in order to determine the actual anticipated disbursement dates for private loans. Actual disbursements amounts can be viewed after they occur by logging into Student Information Online (SIO) on <https://www.cmu.edu/hub/sio/about.html> and selecting "Student Account Activity" from the "Finances" menu.

### Federal Work-Study Disbursements

Students who are awarded Federal Work-Study may earn Federal Work-Study funds by working in positions with eligible employers. Wages are paid bi-weekly through the payroll system. **These funds are not disbursed directly to the student account.**

### Outside Scholarships Disbursements



Once the Student Financial Aid Office receives outside scholarship funds, they are credited to the student account and the student is notified if the outside scholarship reduces their eligibility for other financial aid. If the scholarship provider issues the funds by check, the student will be contacted to endorse the check prior to the funds being credited to their student account.

#### Financial Aid/Student Account Refunds

When financial aid disburses, it is credited against the student account balance. If there is a credit balance remaining on the student account after all tuition and fees are paid, the student account is reviewed to determine if the student is eligible for a credit balance refund. If eligible, the refund is issued to the student either electronically (if you signed up for electronic refunding) or by paper check. View more information about refunds on our website, including electronic refund steps, on: <https://www.cmu.edu/sfs/billing/refunds.html>.

### Section 32: Satisfactory Academic Progress Policy & Procedural Statement

To be eligible for federal, state, and institutional financial aid, all students are required to maintain Satisfactory Academic Progress toward the completion of a degree. Each university determines its own policy in accordance with federal regulations set forth by the U. S. Department of Education regarding satisfactory progress standards to ensure student success. To maintain Satisfactory Academic Progress at Carnegie Mellon University, students must meet the following minimum standards for both of the qualitative (QPA) and quantitative (completion rate) measures:

#### Student Type QPA (Qualitative) Completion Rate (Quantitative)\*

First Year Undergraduate 1.75 80%  
Upperclass 2.00 80%  
Graduate 3.00 80%

\*To calculate the completion rate, the cumulative number of completed units is divided by the cumulative number of units attempted. Advance Placement credits are excluded



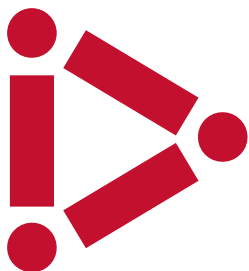
from both figures. In addition to the above-mentioned Financial Aid Satisfactory Academic Progress standards, federal regulations require a student to complete their degree within a specified amount of time. The maximum timeframe cannot exceed 150 percent of the time published as needed for completion of the program. Scope: This policy applies to Federal aid including Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Work-Study, Federal Direct Loans, and Federal Direct PLUS Loan programs; state grant aid; and Carnegie Mellon institutional aid including grants, loans, and scholarships.

Federal regulations can be found at: Federal Student Aid Handbook, Volume 1 Chapter 1 School Determined Requirements 34 CFR 668.16(e) 34 CFR 668.32(f) 34 CFR 668.34

#### Evaluation:

Carnegie Mellon evaluates all students for Financial Aid Satisfactory Academic Progress annually, at the end of the spring semester. Students that are included in the review are undergraduates, graduates, both full-time and part-time. Courses that do not count toward a student's degree cannot be used to determine enrollment status for financial aid purposes. Carnegie Mellon will count transfer credit hours that are accepted toward a student's educational program as both attempted hours and completed hours. Advanced Placement Non-Degree and Non-Credit courses are not counted as units passed or attempted. When a course is repeated, all grades will be recorded on the official academic transcript and will be calculated in the student's QPA.

For financial aid eligibility, only one repeat per course is permitted in the determination of enrollment status for courses previously passed. If the student withdraws and is not assigned a W grade, then it will not be counted in the number of units attempted or completed. If the W grade is assigned, the units will be counted in the number of units attempted and will be counted as zero in the number of units completed. If the student has incomplete units, the units will be counted as attempted and will be counted as zero in the number of units completed.



The Financial Aid Satisfactory Academic Progress evaluation is a cumulative review of all semesters, regardless of whether or not the student received financial aid during the academic year. If the minimum requirements are not achieved, the student is ineligible to receive financial aid. In such a case, the student is notified and given an option to appeal their financial aid status. More information about the appeal process can be found at [www.cmu.edu/sfs/financial-aid/policies/academic-progress.html](http://www.cmu.edu/sfs/financial-aid/policies/academic-progress.html). A financial aid package will not be completed unless an appeal is received, approved and processed accordingly. If by chance a financial aid package is processed and released to the student, it is conditional and subjected to financial aid removal until an appeal is received, approved and processed accordingly. Contact: Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412- 268-1353.

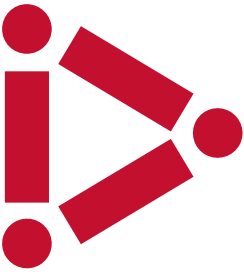
### Appeal Process

Carnegie Mellon realizes that extenuating circumstances may contribute to a student's inability to achieve Satisfactory Academic Progress. Once a student receives notification of their Financial Aid Satisfactory Academic Progress status and it is determined that they are not making progress, the student is encouraged to appeal the determination.

A letter of notification will be mailed to the student that will address the requirements for Satisfactory Academic Progress and define the student's specific academic progress to date. This letter will also address the appeal process and provide directions for filing the appeal.

A student may appeal a Financial Aid Satisfactory Academic Progress decision by writing a letter explaining the extenuating circumstances, defining information that prevented them from making academic progress and what has changed in their situation that would allow them to demonstrate satisfactory academic progress at the next evaluation. The next period of evaluation will be defined in the appeal notification and may be the next semester or combination of enrollment periods.

This letter should be attached to the Financial Aid Satisfactory Academic Progress Appeal Form and returned to The HUB, ATTN: Financial Aid Academic



Progress. The student will be notified in writing of the appeal decision within two weeks of the receipt of the appeal.

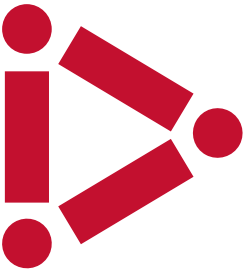
*Examples of Appeals:*

- o Extended illness
- o Changes in major
- o Difficult transition to first-year in college (academically and socially)
- o Recent diagnosis of learning disability
- o Recent death of a close family member

If summer courses at Carnegie Mellon will enable the student to meet the minimum academic progress requirements, the student will regain financial aid eligibility. The student should submit an appeal or send an email to [thehub@andrew.cmu.edu](mailto:thehub@andrew.cmu.edu) indicating that they have now achieved Satisfactory Academic Progress due to summer course completion. If the student takes courses at another institution during the summer that will increase the number of units completed, they will need to forward a copy of the official transcript to their HUB liaison with the copy clearly marked "ATTN: Financial Aid Academic Progress."

If there are missing grades for the spring semester, the student will need to have their instructor update the missing grades. Grades can be checked via Student Information Online (SIO) on our website, <https://www.cmu.edu/hub/sio/about.html>. When all missing grades have been updated, the student should email their HUB liaison to indicate that Satisfactory Academic Progress has been achieved due to the updating of missing grades.

If an appeal is approved for the fall semester only, then the fall semester is considered a probationary semester for financial aid eligibility. To be eligible for financial aid funds for the spring semester, the student is required to achieve a cumulative 2.0 QPA (3.0 for graduate students) and successfully pass a minimum of 80% of the accumulated units attempted/carried. Financial Aid Satisfactory Academic Progress evaluation and reinstatement of spring financial aid occurs shortly after the fall grade submission deadline.



Depending on the nature of the appeal, the appeals committee may require the student to develop an academic plan in consultation with their academic advisor, which may put the student on track to successful program completion. This will be determined on an individual student basis and depend on the length of the student's enrollment, class completion rate and earned grade point average. All subsequent or second appeals will require an academic plan.

If the student is required to develop an academic plan, their progress is reviewed at the end of each payment period according to the requirements specified in the plan. If the student is meeting the requirements of the academic plan, they are eligible to receive financial aid as long as they continue to meet those requirements.

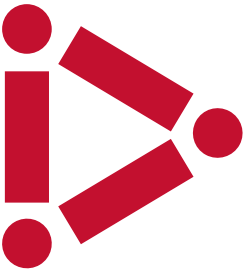
If an appeal is denied, the student should make arrangements to meet with their HUB liaison and an Associate Director of Student Financial Aid to discuss funding options. If an appeal is not received, the student is not eligible to receive financial aid.

#### Financial Aid Academic Progress Improvement Plan

Students who are unable to meet the minimum satisfactory academic requirements for Financial Aid Satisfactory Academic Progress may be required to design and submit a [Financial Aid Academic Progress Improvement Plan \(pdf\)](https://www.cmu.edu/sfs/docs/academic-plan.pdf) (see, <https://www.cmu.edu/sfs/docs/academic-plan.pdf>). The goal of the improvement plan is to ensure the student makes documented steady progress toward meeting our Financial Aid Satisfactory Academic Progress standards and graduates within the university's normal time frame to complete a degree. The need for the plan will be determined on an individual student basis and depend on the length of the student's enrollment, class completion rate and earned grade point average. All subsequent or second appeals will require an academic plan. View more details about the Financial Aid Academic Progress Improvement Plan on our website, <https://www.cmu.edu/sfs/financial-aid/policies/academic-plan.html>.

### Section 33: Federal Title IV Verification Policy and Procedural Statement

#### Policy Reason



The U. S. Department of Education requires that Federal Title IV applicants provide documentation to verify the accuracy of the information submitted on the Free Application for Federal Student Aid (FAFSA) each year. Federal regulations include verification as part of the Federal Student Aid (FSA) program requirements, and it is required for applicants for most FSA programs with the exception of students receiving only a parent or graduate PLUS loan or an unsubsidized Stafford loan. Each university is required to have policies for verifying the reported information. Federal regulations can be found at: Federal Student Aid Handbook Application & Verification Guide Chapter 4: Verification, Updates, and Corrections 34 CFR 668.51-61.

#### Policy and Procedural Statement

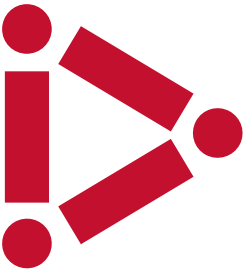
Federal verification guidelines require that applicants are selected for verification by the Central Processing System (CPS) or by the school. At Carnegie Mellon, federal verification is performed on all applicants selected by the CPS and any application that the university has reason to believe is incorrect or has conflicting documentation. Under certain circumstances a CPS selected application may be excluded from some or all of the federal verification requirements due to the following unusual circumstances including:

- death of the student,
- not an aid recipient,
- applicant is eligible to receive only unsubsidized student financial assistance,
- applicant verified by another school or post enrollment (the student was selected for verification after ceasing to be enrolled).

With the exception of the death of the student, however, none of these exemptions excuse the university from the requirement to resolve conflicting information.

Federal verification must typically be completed prior to the end of the academic year or before the student ceases enrollment, whichever occurs first. Students, who fail to comply with verification requirements, including submitting documentation within required timelines, will not have Federal Title IV funds disbursed and may have





Federal Title IV funds cancelled. Carnegie Mellon considers the student to be the responsible party for providing information and completing the verification process. Carnegie Mellon identifies the students selected for verification during the financial aid application process by viewing the FAFSA output document called the Institutional Student Information Record (ISIR). A review of the student's financial aid application occurs after ISIR data is received and data entry of required information is completed. The ISIR will provide information about the student and family including a calculated

Expected Family Contribution (EFC), document codes identifying specific information about the applicant data submitted, and written comments. The written messages provide additional information for the applicant to follow. The federal verification message for the student reads: "Your FAFSA has been selected for a review process called verification. Your school has the authority to request copies of certain financial documents from you and your parent(s)." The verification activity will initially compare applicant data for accuracy and completeness and continue to resolve conflicting information. In this process Carnegie Mellon requires verification of the following items:

For all applicants:

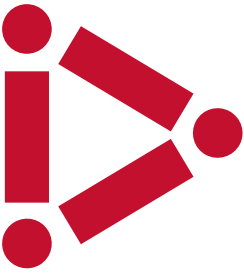
- Household size
- Number in college

For non-tax filers:

- Income earned from work

For tax filers:

- Adjusted Gross Income (AGI)
- U.S. income tax paid
- Income earned from work
- Education tax credits (American Opportunity Tax Credit and Lifetime Learning Tax Credit)



■ Other untaxed income reported on tax return, for example: untaxed portions of Individual Retirement Account (IRA) distributions, untaxed portions of pensions, IRA deductions and payments, tax-exempt interest income

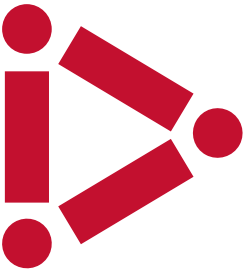
To complete the verification process acceptable documentation may include IRS Tax Transcripts, IRS Tax Forms (1040, 1040-SR, 1040-NR, and requested tax schedules), W 2's and the CSS/Financial Aid PROFILE. To resolve discrepancies in reported information students may be required to submit additional documentation. Verification results that require changes to the applicant information and subsequent changes to the student's financial aid package will be made prior to final disbursement of federal funds. For all students eligible for subsidized Title IV aid the university will make appropriate changes to the student information electronically through the Department of Education's CPS to ensure each student has a correct valid ISIR. The student will be notified of this adjustment through a revised financial aid award letter.

If the verification results do not justify aid already disbursed, the student is responsible for repaying all aid for which they are not eligible. Failure to meet the repayment obligation will result in the student being referred by Carnegie Mellon to the U.S. Department of Education.

Verification results that reveal possible fraud or criminal misconduct in connection with the financial aid application or verification processes will result in the matter being referred by Carnegie Mellon to the Office of the Inspector General of the U.S. Department of Education for investigation. In the event that individual circumstances and unusual situations are not addressed or defined through standard verification procedures, additional review is necessary. These cases must be sufficiently documented and may be processed in accordance with regulations as defined in Professional Judgment and Dependency Overrides Statute: HEA Sec.479A(a)(7) and Sec. 480 (d)(7).

### Federal Title IV Funds Disbursements

Carnegie Mellon completes federal verification for selected applicants as a requirement of completing a student's financial aid application. Federal Title IV funds



will not be disbursed until federal verification is completed. In some instances the institution can make an interim disbursement of funds if it has no reason to believe that the application information is inaccurate. If the institution makes an interim disbursement, the verification process must be completed prior to the disbursement of any additional funds. In all instances the institution is liable for an interim disbursement if verification identifies an overpayment or the student fails to complete verification.

#### Contact

Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412- 268-1353.

### **Section 34: Return to Title IV Funds Policy and Procedural Statement (effective 7.1.2021)**

#### Policy Reason

The U. S. Department of Education requires that the university determine the amount of Federal Title IV aid earned by a student who withdrawals or fails to complete the period of enrollment. The university *must determine the earned and unearned portions of Title IV aid as of the date the student ceased attendance* based on the amount of time the student has spent in attendance. Unless the student meets one of the exemptions below in items 1 – 4, up through the 60% point in the period of enrollment, a pro rata schedule is used to determine the amount of Title IV funds the student has earned at the time of withdrawal. After the 60% point in the period of enrollment a student has earned 100% of the Title IV funds they were scheduled to receive. For a student who withdraws after the 60% point-in time, there are no unearned funds. Effective July 1, 2021, there are four ways in which a student enrolled in a program delivered in modules\*\* is exempt from the normal rules for return of Title IV funds (R2T4) mentioned above, and thus is not considered to be a withdrawal. Even though a student may meet one of the exemptions for R2T4, a student's cost of attendance and financial aid may need to be reduced if the student does not attend all periods of enrollment for which Title IV aid has been determined. The 4 exemptions are:



1. If the student has completed all requirements for graduation within the payment period or period of enrollment;
2. If the student successfully completes Title IV-eligible coursework in one module or a combination of modules that equals 49% or more of the number of countable days\*\* in the payment period or period of enrollment; or
3. If the student successfully completes Title IV-eligible coursework equal to or greater than what the school considers to be half-time enrollment (18 units) for the payment period or period of enrollment.
4. If a student who has dropped all classes except for classes in a future module within the semester has provided written confirmation to the school of their intention to return within 45 days within the same semester. Pre-registration does not constitute written confirmation.

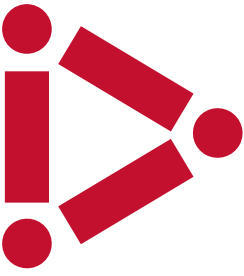
\*A student is considered to be enrolled in a program delivered in modules in any semester in which the student is enrolled in any class that does not span the entire semester.

\*\*Countable days for calculating the 49% exemption include the first day of classes up to and including the last day of classes in the student's individual enrollment period (semester or mini), including days between modules and excluding breaks of 5 or more days.

All courses for which the student is registered AND courses for which the student has begun attendance are considered when determining the 49% exemption, even those courses that have been dropped. Federal regulations can be found at: Federal Student Aid Handbook, Volume 5 Chapter 1 Withdrawals and the Return of Title IV Funds; 34 CFR 668.22

At Carnegie Mellon, Title IV funds are awarded to a student under the assumption that the student will attend school for the entire period for which the assistance is awarded. When a student withdraws, the student may no longer be eligible for the full amount of Title IV funds that the student was originally scheduled to receive.

If a recipient of Title IV grant or loan funds withdraws from a school after beginning attendance, the amount of Title IV grant or loan assistance earned by the student must be determined. Additionally, if a recipient of Title IV grant or loan funds



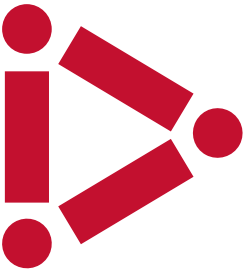
who is enrolled in a program delivered in modules does not attend all scheduled modules or withdraws from a module, the school must determine whether the student is considered to be a Title IV withdrawal and must determine the amount of Title IV grant or loan assistance earned by the student. If the amount disbursed to the student is greater than the amount the student earned, the unearned funds must be returned. If the amount disbursed to the student is less than the amount the student earned, and for which the student is otherwise eligible, the student is eligible to receive a Post-withdrawal disbursement of the earned aid that was not received.

Carnegie Mellon determines the Withdrawal Date and Date of Determination to complete the return of funds calculation. A student's withdrawal date and date of determination varies depending on the type of withdrawal. When a student provides official notification to Carnegie Mellon through the Student Leave of Absence and Withdrawal Process, the withdrawal is defined as an official withdrawal. When the student does not complete the Student Leave of Absence and Withdrawal Process and no official notification is provided by the student, it is considered an unofficial withdrawal.

### Leave of Absence/Withdrawal Process

A student may leave Carnegie Mellon by either taking an academic leave of absence (leaving the university temporarily with the firm and stated intention of returning) or by withdrawing from the university (leaving the university with no intention of returning). In accordance with the provisions of CFR 668.22, regardless of the reason for taking an academic leave of absence, both academic leaves and withdrawals at Carnegie Mellon University are considered withdrawals for Title IV purposes. That is, the student begins any applicable grace period for loan repayment as of the date of the academic leave or withdrawal, regardless of the reason for leaving school or the intention to return. Students choosing to take an academic leave of absence should first contact their academic advisor to discuss their plans while on leave and to work out any conditions that may be necessary for a smooth return to Carnegie Mellon. A student deciding to leave the university should take the following steps:

- Complete a Leave of Absence or Withdrawal Form.



- The form must include all necessary signatures or the process will not be completed.
- Return the completed form to the University Registrar's Office, 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213.

### Determination of Withdrawal Date

#### Official Withdrawals (Notification Provided by the Student)

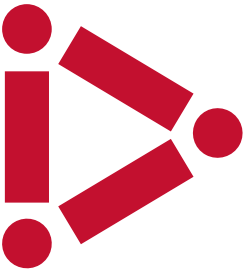
Those withdrawals defined as official are processed in accordance with federal regulations. The Office of the Registrar provides information that identifies which students have processed a Student Leave of Absence and Withdrawal Form for each semester. This information includes the Date of Withdrawal, the Date of Determination, Withdrawal/Leave Status (LA, LS, & W2) and the semester of attendance. This information is maintained in the student's academic file and in the university's Student Information System. For students who notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is the earliest of:

- Date the student began the withdrawal or leave of absence process;
- Date the student notified his or her home department;
- Date the student notified the associate dean of his or her college; or
- Date the student notified the dean of students.

**Unofficial Withdrawal (No Official Notification Provided by the Student)** For a student who withdraws without providing notification to Carnegie Mellon, the institution determines the withdrawal date using defined criteria. This category of withdrawals includes students that drop out and students that do not earn a passing grade. To identify the unofficial withdrawals the Registrar develops a preliminary list of students that did not complete the semester by reviewing the final student grade reports. The list includes all students with:

- a) semester units carried,
- b) 0 semester units passed,
- c) 0 quality points earned, and
- d) 0.0 QPA.

The Registrar contacts the academic divisions about each student to determine if the student actually completed the semester and earned the grades (0.0) or failed to complete the semester and did not notify the university of their status. For students



who do not notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is:

- The midpoint of the semester or;
- The last date the student attended an academically-related activity such as an exam, tutorial or study group, or the last day a student turned in a class assignment.

#### Date of Determination that the Student Withdrew

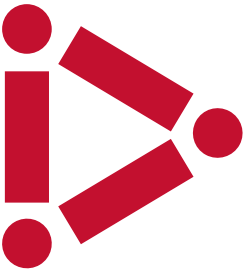
Carnegie Mellon is not required to take attendance and the Date of Determination that a student withdrew varies depending upon the type of withdrawal:

Official or Unofficial

1. For withdrawals where the student provided Official Notification the Date of Determination is:
  - a. The student's withdrawal date,
  - b. or the date of notification, whichever is later.
2. For withdrawals where the student did not provide Official Notification the Date of Determination is:
  - a. The date the institution becomes aware the student has ceased attendance.
  - b. For a student who withdraws without providing notification to the institution, the institution must determine the withdrawal date no later than 30 days after the end of the enrollment period.

#### Calculation of Earned Title IV Assistance

The withdrawal date is used to determine the point in time that the student is considered to have withdrawn so the percentage of the period of enrollment completed by the student can be determined. The percentage of Title IV aid earned is equal to the percentage of the period of enrollment completed. Unless a student who is considered to have withdrawn meets one of the 4 exemptions listed above, the amount of Title IV federal aid earned by the student is determined on a pro-rata basis up to the end of 60% of the semester. For example, if the student completed 30% of a term, 30% of the aid originally scheduled to be received would have been earned. Once a student has completed more than 60% of a term, all awarded aid (100%) has been earned.



The percentage of federal aid earned and the order in which the unearned aid is returned are defined by federal regulatory requirements.

The calculation of earned Title IV funds includes the following grant and loan funds if they were disbursed or could have been disbursed to the student for the period of enrollment for which the Return calculation is being performed:

- Pell Grant
- Iraq and Afghanistan Service Grant
- TEACH Grant (not available at Carnegie Mellon)
- FSEOG Grant
- Federal Direct Loan

### Institutional Charges

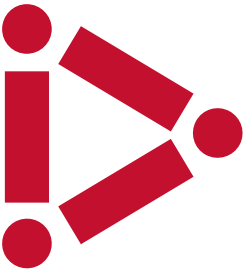
Institutional charges are used to determine the portion of unearned Title IV aid that the school is responsible for returning. Carnegie Mellon ensures that all charges for tuition, fees, living expenses, as well as all other applicable institutional charges are included in the return calculation. Institutional charges do not affect the amount of Title IV aid that a student earns when they withdraw. The institutional charges used in the calculation

usually are the charges that were initially assessed the student for the period of enrollment. Initial charges are only adjusted by those changes the institution made prior to the student's withdrawal (for example, for a change in enrollment status unrelated to the withdrawal). If, after a student withdraws, the institution changes the amount of institutional charges it is assessing a student, or decides to eliminate all institutional charges, those changes affect neither the charges nor aid earned in the calculation.

### Return of Unearned Funds to Title IV

If the total amount of Title IV grant and/or loan assistance that was earned as of the withdrawal date is less than the amount that was disbursed to the student, the difference between the two amounts will be returned to the Title IV program(s) and no further disbursements will be made. If a student has received excess funds, the College must return a portion of the excess equal to the lesser of the student's institutional charges multiplied by the unearned percentage of funds, or the entire





amount of the excess funds. The funds will be returned in the order below as prescribed by federal regulations, within 45 days from the date of determination that a student withdrew.

- Unsubsidized Federal Stafford Loans
- Subsidized Federal Stafford Loans
- Federal PLUS loans
- Federal Pell Grants
- Federal Supplemental Educational Opportunity Grants (FSEOG)

#### Post-Withdrawal Disbursements

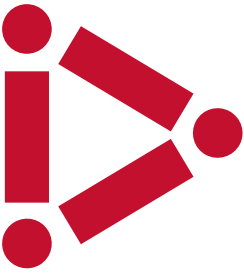
If the total amounts of the Title IV grant and/or loan assistance earned as of the withdrawal date is more than the amount that was disbursed to the student, the difference between the two amounts will be treated as a post-withdrawal disbursement. In the event that there are outstanding charges on the student's account, Carnegie Mellon will credit the student's account for all or part of the amount of the post-withdrawal disbursement up to the amount of the allowable charges. Any amount of a post-withdrawal disbursement that is not credited to a student's account will be offered to the student within 30 days of the date that the institution determined that the student withdrew. Upon receipt of a timely response from the student, the College will disburse the funds within 90 days of the date of determination of the student's withdrawal date.

#### Contact

Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412-268-1353.

#### Section 35: Carnegie Mellon Ethics Hotline

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity relating to financial matters, academic and student life, human relations, health and campus safety or research. Students, faculty and staff can anonymously file a report by calling 877-700-7050 or visiting [www.reportit.net](http://www.reportit.net) (user name: tartans; password: plaid).



All submissions will be reported to appropriate university personnel. The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.

### **Section 36: Statement of Assurance**

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the Office for Institutional Equity and Title IX, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-7125.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.

Updated: 3/31/2025

# Master of Entertainment Industry Management Program



**Carnegie Mellon University**

Applicable Dates

August 19, 2024 – May 9, 2025 Academic Year  
May 12, 2025 – August 22, 2025 Summer Internship

*Last Revision Wed. June 18, 2024*

Daniel T. Green, Ph.D., Program Director

## **College of Fine Arts**

Mary Ellen Poole, Ph.D. Dean  
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### **MEIM – Pittsburgh (Year One)**

Hamburg Hall 1119E, 4800 Forbes Ave. Pittsburgh, PA 15213 412.268.6706

### **MEIM - Los Angeles (Year Two)**

4640 Lankershim Blvd. Suite 125 \* North Hollywood, CA 91602 818.980.6346

Program Website: <http://heinz.cmu.edu/meim>

Handbook Website: <http://www.heinz.cmu.edu/academic-resources/student-handbook-forms/index.aspx>

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## 1. INTRODUCTION

This handbook provides specific information on the curriculum and program requirements for the Master of Entertainment Industry Management (MEIM) Program. Heinz College also publishes a separate handbook that details College-wide policies and procedures pertaining to educational planning, program committees, teaching, scheduling and course credit, performance standards, academic standing, ethics and discipline, student privacy rights, and major forms and deadlines. Students should familiarize themselves with both, as each contains information that is critical for your success. These handbooks can be obtained through your program director and via the Heinz College website at:

<http://www.heinz.cmu.edu/academic-resources/student-handbook-forms/index.aspx>

### 1.1 ABOUT HEINZ COLLEGE

The Heinz College was founded in 1968 by a small group of faculty members from the Graduate School of Industrial Administration (now the Tepper School of Business) to better prepare students for the challenges of public and non-profit sector management careers. Originally named the School of Urban and Public Affairs (SUPA), the College offered training in public policy and management through the Master of Science in Public Policy and Management (MSPPM) program. In 1982, the Master of Public Management (MPM) program was added to the College, and in 1987, the Master of Arts Management (MAM) program was created in collaboration with the College of Fine Arts. In the mid-1990's, the College added programs in information systems management to prepare students for private sector careers that bridge the gap between technology and business (MISM and MSISPM). The focus of these programs is on the intelligent application of IT in corporate environments. During the 2000's the program in Entertainment Industry Management was added, as was the MSPPM-DC track.

Over 10,000 students have graduated from the Heinz College and are employed by government, private industry, consulting firms, and non-profit, arts, entertainment, and health organizations around the world. Most students in our full-time master's programs come to the Heinz College with three years or less work experience. Students in the part-time programs typically hold full-time professional positions and have 2 or more years of work experience.

In October 2008, the Heinz School became the H. John Heinz III College with two schools: the School of Information Systems and Management and the School of Public Policy and Management. These two schools serve as the platform for our educational programs listed below.

### 1.2 CARNEGIE MELLON MISSION STATEMENT

The mission statement of Carnegie Mellon University is to create a transformative educational experience for students focused on deep disciplinary knowledge; problem-solving; leadership, communication and interpersonal skills; and personal health and well-being.

To cultivate a transformative university community committed to (a) attracting and retaining diverse, world-class talent; (b) creating a collaborative environment open to the free exchange of ideas, where research,

creativity, innovation, and entrepreneurship can flourish; and (c) ensuring individuals can achieve their full potential.

To impact society in a transformative way - regionally, nationally, and globally - by engaging with partners outside the traditional borders of the university campus.

### 1.3 MEIM MISSION STATEMENT

The mission of the Master of Entertainment Industry Management (MEIM) Program is to prepare the next generation of successful executives and entrepreneurs for leadership in Film, TV, Music, Streaming, and Video Game Production, Research, Management, Marketing and Content Distribution across all entertainment media platforms and screens.

The MEIM program instills critical thinking skills, encourages professionalism, integrity, and business ethics; and promotes career development skills to benefit graduates throughout their career. Based on Heinz College's world-class policy and management curriculum, the MEIM program balances a well-designed, rigorous graduate academic experience with practical professional skills acquired through internships with leading industry companies. The MEIM program seeks to create a diverse, global community that includes students, alumni, faculty and the media/entertainment professional community to collectively address the direction of the industry, and to promote positive and effective change through applied research and business strategies.

The objectives of students in the MEIM Program are to:

- Understand and employ the theoretical foundations of entertainment industry management;
- Apply effective leadership tools, skills and techniques;
- Investigate and expand the field through theoretical and applied research;
- Function effectively in collaborative, team and project-based environments; and
- Operate efficiently in a connected, networked professional setting.

The MEIM Program supports its students through:

- Individual attention to the needs and aspirations of all students;
- A culture that values cooperation, collaboration, professionalism and personal responsibility, and
- An academic community that values diversity, promotes creative thinking, and encourages ethical behavior.



## 2. CARNEGIE MELLON POLICIES & EXPECTATIONS

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this departmental graduate student catalog the following resources are available to assist you in understanding community expectations:

- [The Word/Student Catalog](#)
- [Academic Integrity Website](#)
- [University Policies Website](#)
- [Graduate Education Website](#)

### 2.1 CARNEGIE MELLON CODE

Students at Carnegie Mellon, because they are members of an academic community dedicated to the achievement of excellence, are expected to meet the highest standards of personal, ethical, and moral conduct possible.

These standards require personal integrity, a commitment to honesty without compromise, as well as truth without equivocation, and a willingness to place the good of the community above the good of the self. Obligations once undertaken must be met, commitments kept.

As members of the Carnegie Mellon community, individuals are expected to uphold the standards of the community in addition to holding others accountable for said standards. It is rare that the life of a student in an academic community can be so private that it will not affect the community as a whole or that the above standards do not apply.

The discovery, advancement, and communication of knowledge are not possible without a commitment to these standards. Creativity cannot exist without acknowledgment of the creativity of others. New knowledge cannot be developed without credit for prior knowledge. Without the ability to trust that these principles will be observed, an academic community cannot exist.

The commitment of its faculty, staff, and students to these standards contributes to the high respect in which the Carnegie Mellon degree is held. Students must not destroy that respect by their failure to meet these standards. Students who cannot meet them should voluntarily withdraw from the university.

The [Carnegie Mellon Code](#) can also be found online.

### 3. SUMMARY OF KEY REQUIREMENTS

- 1) Read both the Heinz College handbook as well as the MEIM handbook (catalog).
- 2) Familiarize yourself with the MEIM handbook to ensure that you comply with all program requirements. **If you do not meet all of the requirements for graduation, you will not be permitted to graduate.** You must submit requests for waivers of requirements or approval of special academic programs in advance.
- 3) To graduate, you *must* complete 192 units of coursework with at least a 3.0 cumulative Grade Point Average. You must successfully complete all first-year coursework in Pittsburgh prior to commencing the second year of the program in Los Angeles.
- 4) Your MEIM Program Director or your faculty advisor must approve your initial schedule and all schedule changes.
- 5) For each semester except your last, you must take between 45 and 60 units. In your final semester, all students (international as well as domestic students) must take at least 36 units. This means that you will have to take at least five elective credits during the final semester in order to reach 36 units and be considered full-time.
- 6) Students can change their schedules -- once they have met with their advisor -- using Carnegie Mellon's Online Registration, up until the official Add/Drop deadline for the semester or mini.
- 7) You are permitted to take up to 12 units of Independent Study but you must submit a petition to the MEIM Program Director for permission to take additional units.
- 8) If extenuating circumstances beyond your control prevent you from completing all requirements for a course by the end of a semester, you may ask the instructor for permission to take an incomplete and to make up the work. If the instructor agrees (and s/he may refuse), you must sign a formal contract. You must sign the contract before the end of the semester, and you must complete the work by the end of the following semester. Instructors will impose grade penalties for incompletes, except when they are due to serious illness or other unavoidable circumstances.
- 9) It is your obligation to understand and comply with the rules of academic conduct at Heinz College. Penalties for breach of these standards can range from failure of the course to removal from the program. Be sure that you know each instructor's rules regarding permissible collaboration on assignments.
- 10) You must complete an internship of at least 300 hours in the summer between your first and second years in the program. You will automatically be registered into a 0-unit course #94.900 once you have obtained the internship. You also have a 300-hour internship requirement during the fall and spring semesters of the second year of the program. The MEIM Program Director must approve this internship in advance.
- 11) As summer, fall, and spring internships are a requirement of the MEIM curriculum, F-1 students are allowed to participate via Curricular Practical Training (CPT). CPT employment (paid or unpaid internships) must be directly related to the entertainment industry and must be approved by the MEIM Program Director.

12) A leave of absence must be requested in advance if you intend to be away from College for an extended period of time. Any student who interrupts his or her program of study without such approval will be deemed to have withdrawn and will be required to seek readmission before returning.

#### 4. MEIM RESOURCES

There are several people who will be a part of your journey as a MEIM student. What follows are the key personnel who will support you throughout your two years in the program.

A \* denotes Los Angeles based.

Name	Title	Email
Crawford, Brett	MEIM Program Chair	brett@cmu.edu
Eber, David	Director, Admissions & Financial Aid	deber@andrew.cmu.edu
Green, Daniel*	Director, MEIM Program/ Distinguished Service Professor, Entertainment Ind. Management	dtgreen@cmu.edu
Krishnan, Ramayya	Dean, H. John Heinz III College	rk2x@andrew.cmu.edu
Poole, Mary Ellen	Dean, College of Fine Arts	mepoole@cmu.edu
Ryan, Mary*	MEIM Senior Academic Coordinator Academic Advisor, Year Two	maryryan@andrew.cmu.edu
Sandor, Angeline	Academic Advisor, Year One	asandor@andrew.cmu.edu
Spangler, Matthew	Assistant Director, Career Services	mspanpler@cmu.edu
Wasser, Andy	Associate Dean, H. John Heinz III College	awasser@cmu.edu

#### 5. EDUCATIONAL PLANNING

##### 5.1 ADVISORS

During your first year in Pittsburgh, you will have access to two advisors each year. One advisor will be the MEIM program director. You will also be assigned a first-year advisor (located in Pittsburgh) to help with day-to-day advisement. Your advisors can help you in selecting courses and working through academic problems. A mandatory advising session with the advisors will be planned prior to orientation. In addition, you should plan to meet with your advisor(s) each semester, but feel free to call upon your advisor or program director at any time. It is your responsibility to obtain approval and communicate schedule and class changes to the program director as well the assigned advisor. In the second year of the program, you will also have access to two advisors (see above for names).

## 5.2 PRE-REGISTRATION PROCESS

To ensure that students in all programs are completing courses in the best sequence for their degree program, students will be pre-registered by the Office of Academic Services at Heinz College for their first semester of courses. The Office of Academic Services will begin to register students prior to their start date. This schedule is not absolute. You may see a 36-unit course on your schedule for a brief period of time to indicate that you will be a full-time student at Heinz College. This 36-unit course is only a placeholder that the Office of Academic Services will use until your core/required courses have been assigned. However, you may or may not see actual courses added to your online schedule until just before classes begin.

Following the results of the Placement Exams that are held during the summer, students may have the flexibility to add additional courses to their first semester schedule. Students will meet with their academic advisor(s) prior to the beginning of classes in order to finalize their first semester schedule.

## 5.3 STUDENT RESPONSIBILITIES

The College's faculty and staff will try to help you in every way possible to successfully complete your program. However, it is ultimately your responsibility to ensure that you meet all of your program's requirements.

## 5.4 CHANGES TO REQUIREMENTS

This handbook is intended to summarize the policies of the MEIM curricular requirements. These policies and requirements may change. The College will make a serious effort to see that all students are informed of any relevant changes in policy or operations. In general, when such revisions and additions increase requirements, only the next entering class will be bound by such revisions unless specifically communicated to the student.

## 6. CURRICULUM

The MEIM Program is to be completed in two academic years of full-time study – one year in Pittsburgh and one year in Los Angeles. You must successfully complete all first-year coursework in Pittsburgh prior to commencing the second year of the program in Los Angeles. The MEIM curriculum is structured with a set of Common Core courses and electives. In order to successfully complete the MEIM Program, you must complete the following:

- 192 units of course credit;
- passing grades (C-) in all Core courses (unless you exempt them);
- obtain a total QPA of 3.0
- approved electives;
- successful completion of the Capstone project; and
- all other standards for graduation, including meeting minimum grade point averages and completing the required practicum assignments (internships) in good standing.

## 6.1 COURSE LOADS

A full semester course carries 12 units of credit and is generally expected to require an average of 12 hours per week of time, including time spent in and out of the classroom. “Mini” courses are those that are half a semester in length; they generally carry 6 units of credit, and also require approximately 12 hours per week of time. At times, there may be a 3-unit or 4-unit elective “mini” course offered. These classes are set up to expose the student to a specific area or distinct subject matter in the entertainment industry.

Most students will need to take a minimum of 48 units in the fall semester and 54 units in the spring semester in year one in Pittsburgh. The maximum number of units you can take each semester is 60 units.

### First Year - Pittsburgh

Fall Semester	Spring Semester
<ul style="list-style-type: none"> <li>• 42 Units Core</li> <li>• 6 Units - Electives</li> <li>• 48 Units minimum needed</li> <li>• Can take up to 60 units</li> </ul>	<ul style="list-style-type: none"> <li>• 30 units Core</li> <li>• 24 Units – Electives</li> <li>• 54 Units minimum needed</li> <li>• Can take up to 60 units</li> </ul>

### Second Year - Los Angeles

Fall Semester	Spring Semester
<ul style="list-style-type: none"> <li>• 46 Units Core</li> <li>• Electives (Can take up to 13 units)</li> </ul>	<ul style="list-style-type: none"> <li>• 31 Units Core</li> <li>• Electives (Can take up to 18 units)</li> <li>• You will need at least 5 elective units to get to 36 units to be full-time status</li> <li>• Entire Year 2 = Typically 90 units minimum</li> </ul>

149 Core + 43 Electives = 192 Minimum Units to graduate

## 6.2 CORE (REQUIRED) COURSES

### *MEIM-Specific Core Courses:*

93.851 Film Economics, Marketing & Distribution	12 units
93.852 Production Management	6 units
93.853 Digital Innovation & Entrepreneurship	6 units
93.855 Intellectual Property Rights	6 units
93.856 Business Development	6 units
93.858 Market Research in Entertainment	3 units
93.861 Script/Story Analysis	6 units
93.869 Television Economics	6 units
93.871 Television Business & Legal Affairs	9 units
93.876 Television Marketing & Advertising	6 units
93.879 Navigating the Entertainment Industry	3 units
93.887 Practicum I	1 unit
93.888 Practicum II	1 unit
93.889 Capstone Management Project I	3 units
93.890 Capstone Management Project II	9 units

94.900 Practicum (Summer) 0 units  
*83 units sub total*

*Heinz College Courses:*

90.707 Statistical Reasoning/90.711 Stat. Reasoning with R/90.777 Intermediate 12 units  
 90.710 Applied Economic Analysis 12 units  
 90.718 Strategic Presentation Skills 6 units  
 90.723 Financial Statement and Analysis of Companies 6 units  
 93.880 Production Finance 6 units  
 93.717 Writing for the Creative Industries (93.701) or Business Writing 6 units  
 94.700 Organizational Design and Implementation 6 units  
 94.800 Negotiation 6 units  
 94.732 Managing Disruption in Media and Entertainment 6 units

*66 units sub total*

*149 units of Core Classes*

### 6.3 ELECTIVES

Below are courses MEIM students have taken as electives. Not every course will be available each semester and the semester listed may change from year to year. For a complete list of electives, please consult either the Heinz College Fall and Spring schedules of courses or the individual department catalogue:

<http://www.heinz.cmu.edu/academic-resources/course-schedules/index.aspx>

The list of courses is here: [https://api.heinz.cmu.edu/courses/api/course\\_list/](https://api.heinz.cmu.edu/courses/api/course_list/)

Pittsburgh Elective (Sample List)

Course #	Title	Units	College /Pre-req
<i>IT Electives</i>			
90-728	Introduction to Database Management	6	Heinz
90-782	Multimedia	12	Heinz
90-801/ 90-804	Media & Communications Design I / II	6	Heinz
90-812	Python Programming, I	6	Heinz
94-708	Applied Strategic Marketing	6	Heinz
94-806	Privacy in the Digital Age	6	Heinz
94-823	Measuring Social	12	Heinz
94-870	Telling Stories with Data	6	Heinz
95-723	Managing Disruptive Technologies	6	Heinz / 95-710
95-874	Agile Methods	6	Heinz /
<i>Management Electives</i>			
94-808	Management Consulting	12	Heinz
94-811	Strategy Development	6	Heinz
94-813	Project Management	6	Heinz

94-854	Developing as a Leader	6	Heinz
94-814	Evidence Based Management	6	Heinz
<b><i>Writing-Focused Electives</i></b>			
93-870	Introduction to Writing for Television	9	Heinz
54-187	Writing the Adaptation for Stage & Screen	9	Drama
54-195	Mystic and Supernatural Writing for the Screen and Stage	9	Drama
76-723	Text to Screen	9	Dietrich/IDeATe
90-700	Heinz Journal	3	Heinz
94-843	Research Studio: Arts Management and Technology	6	Dietrich/IDeATe
<b><i>Acting Electives</i></b>			
94-801	Acting for Management/ Acting for Leadership & Communication	6	Heinz
45-895	Acting for Business	6	Tepper
54-191	Acting for Non-Majors	9	Drama
<b><i>Music-Related Electives</i></b>			
57-801	Introduction to Music Technology	6	Dietrich/IDeATe
54-702	Graduate Music Reading for Production	3	Drama
57-780	Black American Music Seminar	6	Music
57-344 or 60-407	Experiment Sound Synthesis	9	Dietrich/IDeATe
57-758	Business of Music	6	Music
57-947	Sound Recording	6	Music
57-338	Sound Editing and Mastering	6	Music 57-947
57-801	Introduction to Music Technology	6	Music
57-337/ 57-947	Sound Recording	6	Dietrich/IDeATe
<b><i>Video Game &amp; Animation Related Electives</i></b>			
99-358	IDEATE Unity 3D Intro	1	IDeATE
99-359	IDEATE 3d Modeling/Printing 1	1	IDeATE
53-614	Introduction to Game Design	12	Dietrich/IDeATe
53-371	Role Playing Games Writing Workshop	12	ETC 15104 or 62150
53-320	IDeATe Special Topics in Animation: Character Modeling	6	ETC/IDeATe
82-250	Digital Realities: Introducing Immersive Technologies for Arts and Culture	9	Dietrich/IDeATe
82-237	Animated Storytelling, Chinese Ghost Stories and Shadow Play	9	Dietrich/IDeATe
<b><i>Other Entertainment-Related Electives</i></b>			
53-312	Guest Experience in Theme Park Design	9	ETC
93-830	Technologies Transforming the Arts	6	Heinz
54-900	Staging Media	9	Drama
90-840	Media & American Politics	6	Heinz

<b>Los Angeles Electives – Offered in Year 2 of the Program</b>				
93.854	Film Acquisition	3	S	Heinz/CFA
93.857	The Business of Gaming	4	F	Heinz/CFA
93.859	Fandom in Music in Media	3	S	Heinz/CFA
93.864	Music Monetization: Song Royalties	3	F	Heinz/CFA
93.866	Creative Producing	6	S	Heinz/CFA
93.873	Film Exhibition	3	S	Heinz/CFA
93.878	Branded Entertainment	3	S	Heinz/CFA
93.837	Artist Development in the Music Industry	3	F	Heinz/CFA
93.872	Music Supervision	3	F	Heinz/CFA
93.882	AI and the Future of Creativity in Entertainment	3	F	Heinz/CFA
93.860	What Makes Us Play: The Craft of the Video Game	4	S	Heinz/CFA

## 7. RECOMMENDED SCHEDULE OF COURSES

The following schedule of courses, recommended by the MEIM Program, meets the *minimum* unit requirements for graduation (192 units).

### MEIM Course Schedule for the Class of 2025

Year 1 Fall: 42 Core (12 electives) = 48 minimum

Year 1 Spring: 30 Core (24 electives) = 54 minimum

Year 1 = 108 units (for most students)

### Summer between year one & two:

Need to complete Summer Practicum (0 units)

Year 2 Fall: 46 Core (up to 16 electives)

Year 2 Spring: 31 Core (up to 18 electives)

Year 2 = 90 units minimum, unless more in year one

**149 Core + 43 Electives = 192 Units Total to graduate**

NOTE: Core courses must be taken according to the schedule below, unless you obtain permission from the MEIM Program Director to defer required courses or you exempt the class. If you exempt a first-year required course, contact your advisor

about appropriate electives or other core courses you might take. Please note that you must successfully complete all first-year classes (in Pittsburgh) before commencing the second year of the program (in Los Angeles).



**7.1 FIRST YEAR (PITTSBURGH)**

**Fall Semester 2024**

**Spring Semester 2025**

Course Number	Course Name	Units	Course Number	Course Name	Units
90.710	Econ Analysis 90.709 Intermediate	12	90.718	Strategic Presentation	6
90.707	Stats 90.777 Interm. /90.711 Stats w/R	12	90.723	Finance Statements Analy. of Comp.	6
93.861	Script & Story Analysis	6	93.880	Production Finance	6
93.717	Writing (94.701) Bus writing	6	94.732	Managing Disruption: Media/Entert ^	6
94.700	Org Design & Implement	6	94.800	Negotiation	6
			9x.xxx	Electives	24
		42 Core 06 Electives 48 total			30 Core 24 Electives 54 total

\*90.707 Statistical Reasoning/ 90.711 Statistical Reasoning with R/ 90.777 Intermediate Statistical Methods

^ Class counts towards Heinz IT Requirement

**7.2 SUMMER INTERNSHIP: BETWEEN YEAR ONE AND TWO**

**Summer 2025**

Course Number	Course Name	Units
94.900	Summer Practicum	0

**7.3 SECOND YEAR (LOS ANGELES)**

**Fall Semester 2025**

**Spring Semester 2026**

Course Number	Course Name	Units	Course Number	Course Name	Units
93.851	Film Econ Mktg. & Distribution	12	93.855	Intellectual Property	6
93.852	Production Management	6	93.856	Business	6
93.853^	Digital Innovation/Entrepreneur ^	6	93.858	Development	3
93.871	TV Bus & Legal Affairs	9	93.869	Market Research in Entertainment	6
93.876	TV Marketing & Advertising	6	93.888	Television Economics	1
93.879*	Navigating the Ent. Industry	3	93.890	Practicum II	9
93.887	Practicum I	1	-----	Capstone II	---
93.889	Capstone I	3	93.854	-----LA Electives-----	3
-----	-----LA Electives-----	---	93.866	Film Acquisitions	6
93.837	Artist Dev. in the Music Industry	4	93.872	Creative Producing	3
93.857	The Business of Gaming	3	93.873	Music Supervision	3
93.859	Fandom in Music and Media	3	93.878	Film Exhibition	3
93.864	Music Monetization/ Song Royalties	3	93.860	Branded Entertainment	4
93.882	AI & the Future of Creativity in Entertainment	3		What Makes Us Play: Craft of the Video Game	
		46 Core 16 Elective		Need 36 minimum	31 Core 22 Elective
	* 93.879 & 93.882 are pass/fail courses ^ Class counts towards Heinz IT Requirement			* Some LA electives may change due to faculty availability	

## 8. THE CAPSTONE PROJECT: ENTERTAINMENT INDUSTRY PARTNERS

A key feature of the MEIM second-year curriculum is the Capstone Project. This yearlong mandatory course goes further than a traditional thesis by giving students the opportunity to work on a topical applied research project under the direction and guidance of a marquee entertainment business client company. The Capstone project offers students the opportunity to apply and demonstrate their analytical and practical management skills in relation to a specific concept or issue while addressing and deepening their understanding of the challenges and issues the entertainment industry faces on a daily basis.

### 8.1 COLLABORATION

The Capstone thesis gives students the opportunity to work together in teams, much as they will do in their actual careers within this very project-centric, team-oriented industry. Researching, compiling, drafting and presenting the Capstone Project provides students with a compelling “deliverable” on their resume, further supporting their career prospects. Work experiences gained from student projects provide strong comparative advantages to graduating students in job interviewing and acquiring job offers. There is both a writing component and a presentation component related to the Capstone thesis. Working together on the Capstone, students will:

- Develop project management, teamwork, and communication skills
- Integrate and synthesize the lessons from prior coursework
- Engage in a "real world" organizational experience
- Earn “bragging rights” around a professional project for an industry company performed as part of the degree.

**8.2 PAST CAPSTONE SPONSORS HAVE INCLUDED:**

<ul style="list-style-type: none"> <li>• Ayzenberg Group</li> <li>• 3Blackdot</li> <li>• Adult Swim/Turner Broadcasting</li> <li>• Amblin Television</li> <li>• Anonymous Content</li> <li>• Bally Sports</li> <li>• BBC America</li> <li>• Black List, The</li> <li>• C4 R &amp; D</li> <li>• Concord Music (Stax Records)</li> <li>• CreatorIQ (SocialEdge)</li> <li>• D Squared Entertainment</li> <li>• Enso Collaborative</li> <li>• Faceware Technologies</li> <li>• Flipagram</li> <li>• Fox Television Studios</li> <li>• IM Global</li> <li>• IMAX</li> <li>• IPSOS OTX Research</li> <li>• Jerry Bruckheimer Games</li> <li>• John Wells Productions</li> <li>• Lancit Media</li> <li>• Les Paul Foundation</li> <li>• LD Entertainment</li> <li>• Lionsgate Entertainment</li> <li>• MPRM Public Relations</li> <li>• National Research Group (NRG)</li> <li>• NBCU/Wilshire Studios</li> <li>• Neon Studios</li> </ul>	<ul style="list-style-type: none"> <li>• Networked Insights</li> <li>• Nielsen Company</li> <li>• Omelet/Cheat Code</li> <li>• Paramount</li> <li>• PlayStation</li> <li>• PricewaterhouseCooper</li> <li>• Producers Guild of America, The</li> <li>• Programmers of Colour Collective</li> <li>• PSB Insights</li> <li>• ReFrame (Women in Film)</li> <li>• RelishMIX</li> <li>• Rogers &amp; Cowan PMK</li> <li>• ScreenEngine</li> <li>• Solstice Studios</li> <li>• Sony Music Entertainment</li> <li>• Sony Pictures Television</li> <li>• Sony Studios</li> <li>• Sundance Institute</li> <li>• SuperBam</li> <li>• Toronto International Film Festival</li> <li>• Troika Pictures</li> <li>• Twitter</li> <li>• Variety Media</li> <li>• Village Roadshow Entertainment Group</li> <li>• Walt Disney/ABC Television Group</li> <li>• Warner Bros. Studios</li> <li>• XRM Media</li> </ul>
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**9. INTERNSHIPS**

The required practicum (internship) assignments allow the students to gain first-hand knowledge of how the theories and principles learned in the classroom are implemented in the profession. Not only will this practicum allow students to test and refine classroom experiences in a

professional setting but it also allows students to enhance their personal network of contacts and build their resume. The internships also serve as the foundation for many discussions in the rest of the program's curriculum.

The practicum program provides the necessary foundation for an individual to develop a functional business referral network by giving the student almost 1000 hours of internship time. This time is spent working closely with an array of different colleagues at different levels of their respective hierarchies. By successfully networking their way through these internships, and the attendant networking opportunities after working hours, students can build the kind of referrals they will need to land their first job.

There is an internship requirement during the summer (94.900) and both the fall (93.887) and spring (93.888) semesters of the second year of the program. There is no internship requirement in the first year of the program, though some students do partake in opportunities while in Pittsburgh. Students may do an internship after conferring with the Program Director and the Career Services MEIM representative.

At the end of your internships (summer, fall, and spring) your Career Services Advisor will request that your supervisor complete an evaluation form about your internship performance. You are also required to complete an evaluation survey as well as a self-reflection statement describing how your internship fulfilled the educational goals of the program. If you do not successfully complete an eligible internship along with your survey and self-evaluation, you will not fulfill your internship requirement necessary for graduation.

### **9.1 THE SUMMER INTERNSHIP**

The mandatory summer internship is intended to acquaint MEIM students with industry practices and vernacular, to strengthen the students' professional networks, and to expand students' skills, knowledge, and resumes. Students enroll in a 0-unit Summer Practicum class (94.900).

During the summer between the first and second year of study, MEIM students complete a 300-hour full-time internship at a film, television, digital production studio, music, gaming production company, research company or a related agency. The internship is a core requirement and a graduation requirement of the MEIM Program. Students cannot progress to the second year of the program without successfully completing the summer internship. Please note the following in regard to the summer internship:

- Minimally, the internship is on average comprised of eight-to-ten weeks of employment at 30 hours per week (duration required is a minimum of 300 hours) and is to be completed in the summer between your first and second year only. The internship should have formal supervision, be professional in nature, include work that is of importance to the organization, and should have significant educational value.
- Students must complete the Heinz Internship Extension Course administered by Career Services via Canvas. Students will be automatically enrolled and there will be associated

modules with assignments in which completion of these modules is a requirement to pass the Internship Course.

- Before beginning the internship, students must attend an internship information session in the spring semester hosted by Career Services to learn more about the specific internship requirements and support given by Career Services. Students must also complete the online Career Services Internship Reporting form for approval.
- MEIM students can report one to two internships. The internship must be reported no later than the last business day of June.
- The internship will be verified with the students' supervisors and then approved. Students must notify their Career Advisor of any significant changes in their internships, such as length, location, hours of work, etc.
- Once the internship has been approved, students will be registered for the zero-unit internship course. Students will not receive academic credit for the internship, but it will be reflected on their transcript as a course with P/F grade. If a student plans to exempt the internship, they will need to complete the [Petition for Course Exemption](#).
- **F1 Visa Students:** You must apply for Curricular Practical Training (CPT) employment authorization for your summer internship. CPT authorization is required regardless of the internship being paid or unpaid. CPT is only available to F-1 students who have not graduated and who have been enrolled on a full-time basis for one full academic year (i.e. fall and spring.) The MEIM program requires students to complete a summer internship, therefore international students can qualify for CPT. Processing CPT may take up to 2 weeks and you cannot begin employment until you receive authorization. Guidelines, forms, and instructions can be found at the [Office of International Education's website](#).

## 9.2 SECOND-YEAR PRACTICUM

The second-year practicum is an immersion in the heart of the entertainment industry, exponentially enlarging the benefits of the previous skills and providing the students with a critical platform for showcasing their knowledge and experience.

Unique to the program is the schedule that allows students to work nearly full time (30+ hours/week – Mondays through Thursdays) in the management divisions of film, interactive, music, gaming, television studios, production companies, agencies, or related firms supporting the entertainment industry.

## 9.3 PRACTICUM CREDIT

The MEIM Program recognizes that federal labor law requires the film/television/music/gaming industry to limit internship opportunities to students who receive formal credit for the practicum. The fact that internships are degree requirements is sufficient for most firms' human resources and legal department, but MEIM students may encounter practicum opportunities where more formal credit is required. Because of this, MEIM students enroll for practicum credit (94.900 – summer, 93.887- fall, 93.888 - spring). These are either 0 or 1-unit core class requirements in the program.

According to the U.S. Department of Labor, an internship should be similar to the training a student would receive in an educational environment. The internship experience should be beneficial to the intern and the intern should work under the supervision of existing staff at the company. For that reason, work related to the MEIM internships is to be on-site and not performed remotely. Though a student may be paid for the internship, an intern is not automatically entitled to wages for the time spent at the internship. Many of our students have subsequently been hired at the company where he or she has interned, but it should be noted that the intern is not entitled to a job at the conclusion of the internship.

## 10. UNIVERSITY LIBRARIES

The University Libraries provide a range of services including access to the Libraries' collections, expertise, and facilities; use of collections held by other libraries; and services enabling Carnegie Mellon students, faculty, and staff to deposit their work in the University Libraries.

The University Libraries host a web page ([www.library.cmu.edu](http://www.library.cmu.edu)) that provides access to numerous resources useful to faculty and students in public affairs and administration. These include library catalogs, databases, subject web pages, a virtual reference desk and more. Some frequently used journals include: Human Rights Quarterly, Contributions to Economic Analysis & Policy, Economic Policy Review, Business & Politics, and Global Economy Journal.

The web page also has links to sites focusing on associations and societies, gateways, government documents, journals, reference resources, statistical sources, think tanks and academic departments. Students can find physical books, eBooks, music scores, conference proceedings, reports, government documents, music, videos, streaming content, and more.

Access to most library databases is university-wide and searchable from on- or off-campus. Some of the available databases concerned with public affairs and administration include: PAIS International, INFORMS PubsOnline, Homeland Security Digital Library, LexisNexis Academic, LexisNexisCongressional, CQ Library and ProQuest. In order to request material, a student can go directly to the library (when on campus) or can make requests off campus by visiting the main library website: <https://www.library.cmu.edu/using/borrow/what>

Members of the Carnegie Mellon community can use and borrow directly from The Carnegie Library of Pittsburgh and the University of Pittsburgh libraries except for those that do not participate in the Oakland Library Consortium (OLC): Fine Arts, Law, Nursing, Western Psychiatric Institute, and the Pitt branch libraries in Bradford, Greensburg, Johnstown, and Titusville.

There are three libraries on campus at Carnegie Mellon to which all students, staff and faculty have access.

- Hunt Library, 4909 Frew Street
- Mellon Institute Library, Mellon Institute, 4<sup>th</sup> floor, 4400 Fifth Avenue
- The Engineering and Science Library, Wean Hall, 4<sup>th</sup> floor

In addition, MEIM-LA also has a library with many entertainment industry text books and trade publications.

- MEIM Library, 4640 Lankershim Blvd. Ste 125, North Hollywood CA 91602

The library holds over 700 DVD's of films and TV shows for viewing and research including the American Film Institute (AFI) Top 100 films of all time. The library also holds over 300 books on entertainment related topics. In order to borrow one of these items, students make a request to the MEIM Senior Academic Coordinator and items can be held for up to three weeks.

## 11. WEB RESOURCES

MEIM Web Page	<a href="http://www.heinz.cmu.edu/school-of-public-policy-management/entertainment-industry-management-meim/index.aspx">http://www.heinz.cmu.edu/school-of-public-policy-management/entertainment-industry-management-meim/index.aspx</a>
MEIM LinkedIn	<a href="https://www.linkedin.com/in/meim-program-1933a890/">https://www.linkedin.com/in/meim-program-1933a890/</a>
MEIM Twitter	<a href="https://twitter.com/meimprogram">https://twitter.com/meimprogram</a>
Univeristy Web Ressources	<a href="http://www.cmu.edu">www.cmu.edu</a>
University Libraries	<a href="http://www.library.cmu.edu">www.library.cmu.edu</a>
Heinz College Web Resources	<a href="http://www.heinz.cmu.edu">www.heinz.cmu.edu</a>
Course Schedules	<a href="http://www.heinz.cmu.edu/academic-resources/course-schedules/index.aspx">www.heinz.cmu.edu/academic-resources/course-schedules/index.aspx</a>
Course Descriptions	<a href="http://heinz.cmu.edu/academic-resources/course-results/index.aspx">http://heinz.cmu.edu/academic-resources/course-results/index.aspx</a>
Academic Calendar	<a href="https://www.heinz.cmu.edu/heinz-shared/files/img/current-students/heinz-college-academic-calendar-2022-23.pdf">https://www.heinz.cmu.edu/heinz-shared/files/img/current-students/heinz-college-academic-calendar-2022-23.pdf</a>

## 12. RELATED MEIM PARTICIPATION CONTACTS

Listed below are some of the organizations that MEIM students have been involved with in the past.tiff

Academy of Television Arts and Sciences	<a href="http://www.emmys.com">www.emmys.com</a>
American Pavilion at Cannes, The	<a href="http://ampav.com">ampav.com</a>
Association of Arts Administration Educators	<a href="https://artsadministration.org">https://artsadministration.org</a>
Creative Minds Group at Cannes, The	<a href="http://thecreativemindgroup.com">thecreativemindgroup.com</a>
Emma Bowen Foundation	<a href="https://www.emmabowenfoundation.com">https://www.emmabowenfoundation.com</a>
EntertainmentCareers.net	<a href="http://Entertainmentcareers.net">Entertainmentcareers.net</a>
Festival de Cannes	<a href="http://festival-cannes.com">festival-cannes.com</a>
Film Independent	<a href="http://filminddependent.org">filminddependent.org</a>
Future Now Media & Entertainment Conference	<a href="http://futurenowconference.com">futurenowconference.com</a>
Hollywood Radio & TV Society	<a href="http://hrts.org">hrts.org</a>
IRTS Foundation	<a href="https://irtsfoundation.org">https://irtsfoundation.org</a>
Sundance Film Festival	<a href="http://sundance.org">sundance.org</a>
South by Southwest Film and Interactive Festival	<a href="http://sxsw.com">sxsw.com</a>
T. Howard Foundation	<a href="http://t-howard.org">t-howard.org</a>
Toronto International Film Festival (tiff)	<a href="http://tiff.net">tiff.net</a>

### 13. ACADEMIC STANDARDS

To graduate, you *must* complete 192 units of coursework with at least a 3.0 cumulative Grade Point Average. You must successfully complete all first-year course work in Pittsburgh prior to commencing the second year of the program in Los Angeles. For each semester except your last, you must take between 45 and 60 units. In your final semester, all students (international as well as domestic students) must take at least 36 units. This means that you will have to take at least five elective credits during the final semester in order to reach 36 units and be considered full-time.

#### 13.1 GRADES

Below are the policies surrounding grades for students in the MEIM Program. Instructors are responsible for determining their own grading scale to establish how many points a student may need in order to earn a particular grade. However, the Heinz College operates on the grade weighting system shown below:

Grade	Interpretation	Points
A+	Exceptional	4.33
A	Excellent	4
A-	Very Good	3.67
B+	Good	3.33
B	Acceptable	3
B-	Fair	2.67
C+	Poor	2.33
C	Very Poor	2
C-	Minimal Passing	1.67
R	Failing	0

#### 13.2 UNIVERSITY POLICY ON GRADES

The [university policy on grading](#) offers details concerning university grading principles for students taking courses and covers the specifics of assigning and changing grades, grading options, drop/withdrawals and course repeats. It also defines the undergraduate and graduate grading standards.



## 14. ACADEMIC INTEGRITY POLICY

The following is Carnegie Mellon University's policy on academic integrity.

at <https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>

Additional information and resources regarding Academic Integrity are also available

at <https://www.cmu.edu/student-affairs/ocsi/academic-integrity/index.html>.

Students at Carnegie Mellon are engaged in preparation for professional activity of the highest standards. Each profession constrains its members with both ethical responsibilities and disciplinary limits. To assure the validity of the learning experience a university establishes clear standards for student work.

### 14.1 POLICY STATEMENT

In any manner of presentation, it is the responsibility of each student to produce her/his own original academic work. Collaboration or assistance on academic work to be graded is not permitted unless explicitly authorized by the course instructor(s). Students may utilize the assistance provided by Academic Development, and the Global Communication Center, unless specifically prohibited by the course instructor(s). Any other sources of collaboration or assistance must be specifically authorized by the course instructor(s).

In all academic work to be graded, the citation of all sources is required. When collaboration or assistance is permitted by the course instructor(s) or when a student utilizes the services provided by Academic Development, and the Global Communication Center, and the acknowledgement of any collaboration or assistance is likewise required. This citation and acknowledgement must be incorporated into the work submitted and not separately or at a later point in time. Failure to do so is dishonest and is subject to disciplinary action.

Instructors have a duty to communicate their expectations including those specific to collaboration, assistance, citation and acknowledgement within each course. Students likewise have a duty to ensure that they understand and abide by the standards that apply in any course or academic activity. In the absence of such understanding, it is the student's responsibility to seek additional information and clarification.

#### Policy Violations

Cheating occurs when a student avails her/himself of an unfair or disallowed advantage which includes but is not limited to:

- Theft of or unauthorized access to an exam, answer key or other graded work from previous course offerings.
- Use of an alternate, stand-in or proxy during an examination.
- Copying from the examination or work of another person or source.
- Submission or use of falsified data.
- Using false statements to obtain additional time or other accommodation.

- Falsification of academic credentials.
- Plagiarism is defined as the use of work or concepts contributed by other individuals without proper attribution or citation. Unique ideas or materials taken from another source for either written or oral use must be fully acknowledged in academic work to be graded. Examples of sources expected to be referenced include but are not limited to:
  - Text, either written or spoken, quoted directly or paraphrased.
  - Graphic elements.
  - Passages of music, existing either as sound or as notation.
  - Mathematical proofs.
  - Scientific data.
  - Concepts or material derived from the work, published or unpublished, of another person.

Unauthorized assistance refers to the use of sources of support that have not been specifically authorized in this policy statement or by the course instructor(s) in the completion of academic work to be graded. Such sources of support may include but are not limited to advice or help provided by another individual, published or unpublished written sources, and electronic sources. Examples of unauthorized assistance include but are not limited to:

- Collaboration on any assignment beyond the standards authorized by this policy statement and the course instructor(s).
- Submission of work completed or edited in whole or in part by another person.
- Supplying or communicating unauthorized information or materials, including graded work and answer keys from previous course offerings, in any way to another student.
- Use of unauthorized information or materials, including graded work and answer keys from previous course offerings.
- Use of unauthorized devices.
- Submission for credit of previously completed graded work in a second course without first obtaining permission from the instructor(s) of the second course. In the case of concurrent courses, permission to submit the same work for credit in two courses must be obtained from the instructors of both courses.

Procedures for dealing with allegations of these policy violations are detailed in the university's Academic Disciplinary Action Procedures for Undergraduate Students and the Academic Disciplinary Action Procedures for Graduate Students, which are published in The WORD student handbook. Periodic review of these procedures will be overseen by the Dean of Student Affairs or her/his designee in consultation with Faculty Senate and the relevant student governing bodies. Any amendments to these procedures are subject to the approval of Faculty Senate. Additional guidelines and procedures for graduate students may exist at the college/department/program level, in which case they are communicated in the college/department/program graduate student handbook.

If a student fails a course because of an academic integrity violation and then retakes the course, both the failing grade and the new grade will be used in evaluations of academic standing and the calculation of the student's QPA.

Any student who violates the academic integrity policy may not be a Student Representative, Teaching Assistant, Research Assistant, Officer of a student club/organization and cannot graduate from the college with highest distinction or distinction or serve as commencement speaker. All academic integrity violations will be reported to the Heinz College Associate Dean and Carnegie Mellon's Dean of Student Affairs or designee, as well as the Heinz College Office of Academic Services.

Cases of academic integrity violations will be reviewed by the Dean or designee, who may impose additional penalties. Students should understand clearly that such offenses are not tolerated at Carnegie Mellon. A first offense could result in being dropped from your program. In the event of a second offense, you will be dropped from your program. Students who want to appeal an academic disciplinary action must state in writing to the College Dean their intention to do so within one week of the penalty date in question, and then must present their appeal to the College Dean no later than two weeks after said penalty date. Appeals must be in writing, with appropriate documentation. In cases where an appeal is filed, disciplinary actions will be held until the 2-week moratorium is complete.

If you dispute that your actions violated the University Policy on Academic Integrity or believe that your department did not follow the proper procedure for investigating or reporting a violation, the university has a formal appeal process in place that provides you with the ability to have your case heard before an Academic Review Board. The initial step of that process is writing a letter to the Provost requesting an appeal and you can find more information in the Student Appeals section of the Graduate Academic Disciplinary Actions Overview. Please note that requests for appeal are not granted automatically and the Provost will determine whether the appeal will move forward to a second-level review.

The University policy on Cheating and Plagiarism is posted on Carnegie Mellon's website at: <https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>

## 14.2 ACADEMIC DISCIPLINARY ACTION OVERVIEW - VIOLATIONS OF POLICIES ON CHEATING AND PLAGIARISM

"Academic Disciplinary Actions" are penalties or sanctions imposed for violation of academic regulations against cheating, plagiarism, or unauthorized assistance as defined by course and/or [University Policy](#).

This procedure should be reviewed in its entirety on-line: <https://www.cmu.edu/student-affairs/theword/academic-discipline/index.html>

Carnegie Mellon's policy on Academic Disciplinary Actions Overview for Graduate Students is the university procedure that describes procedures for disciplinary actions against graduate students in cases of alleged violations of academic regulations.

Questions regarding the graduate policies and/or procedures pertaining to cheating and plagiarism should be directed to Joanna Dickert in the Office of Community Standards & Integrity at 412-268-2140.

For comprehensive information and resources regarding Academic Integrity please visit: <https://www.cmu.edu/student-affairs/ocsi/academic-integrity/index.html>

## 15. EXPECTATIONS

It is important that you communicate effectively and efficiently when dealing with staff, faculty, and fellow students. It is not enough to just show up at classes. To make the most out of the program, you should stay engaged and committed. Keep in mind the following as you progress as a master's student.

### 15.1 ACTIVE PARTICIPATION IN CLASS

Your contribution in class is vital. Your focused and attentive participation, openness to others' ideas, and positive attitude toward the learning experience are expected throughout the courses offered in the MEIM program. Many faculty members (and almost all faculty in LA) will have a grading component related to class participation.

### 15.2 SELF-REGULATION

As a master's student, you are expected to regulate your own behavior and to not need to be reminded of deadlines. Ask for feedback, take the initiative to get what you need from classes, and be courageous in the questions you ask. Take risks and take responsibility for your own learning.

### 15.3 COHERENT, PROFESSIONAL WRITING

You are expected to write in a way that is clear, concise, coherent, and professional. Every written assignment should be at least a second draft. If you have difficulty with your writing, Carnegie Mellon does offer assistance via the Global Communications Center on campus. <https://www.cmu.edu/gcc/appointment/index.html>. It is to your advantage to take the initiative to pursue assistance in these areas. You also need to keep electronic communication (emails/LinkedIn) respectful and professional. Communicating effectively is paramount in the entertainment industry.

## 16. CAREER SERVICES

MEIM is a professional program focused on providing career development skills for our students. Heinz College has a dedicated Career Service Office (based in Pittsburgh) to assist students. <https://www.heinz.cmu.edu/current-students/career-services/>. In the second year of the program students continue to have access to all of the services available in the first year of the program.

[The Career and Professional Development Center \(CPDC\)](#) offers a variety of services and programs to all student and alumni such as:

- College- and industry-specific career counseling and employment advising
- Career fairs and employer presentations
- Career workshops and professional development programs
- Interview assistance
- On-campus recruiting and campus employment through Handshake
- Resume/cover letter expertise
- Internships and part-time work
- Access to career-related databases and electronic resources

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 Career and Professional Development Services Center (CPDC) website. <https://www.cmu.edu/career/>

### 16.1 CAREER CONSULTANTS

MEIM has assigned a career consultant who provides guidance through one-on-one appointments. [Matthew Spangler](#) (based in Pittsburgh) is the Assistant Director of Career Services for the MEIM program and works in tandem with the Program Director (based in Los Angeles). A number of events to help students transition into their careers are planned throughout the two years of the program.

Appointments with Matthew can be made through Handshake. Matthew also holds open office hours and bi-monthly program specific career service meetings/group workshops in the first year of the program. The exact dates and times will be communicated at the beginning of each semester.

### 16.2 JOB SEARCH GUIDELINES

MEIM 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 the academic progress through their graduate program.

It is also important for students to understand 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.

### **16.3 PLACEMENT SERVICES**

Heinz College does not place students into an occupation or position. However, Heinz College does offer a dedicated Career Services office to assist students with internships, resumes, job interviewing techniques, ability to access entertainment careers search websites, and the full-time job search. Students apply and interview for the jobs based on their interest and abilities. In addition, the Program Director and the Assistant Director of Career Services work collectively to coach and advise throughout the second year of the program.

## **17. OTHER INFORMATION**

The entertainment industry is very exciting, but can be quite competitive. The move to Los Angeles can also be intimidating at times. Rest assured that Carnegie Mellon staff, faculty and friends of the program will support you as you progress through the two years of the program. You will also have the support of the growing MEIM alumni population. You should take advantage of opportunities that may be presented to you. The two years will go by fast.

### **17.1 COLLEGIALITY**

At its heart, the MEIM program is an opportunity for you to become a colleague with your classmates and others you meet in the program, including professors. In past years, some teachers have even asked students to work on professional projects outside of class. Respect for one another's ideas, a willingness to engage the hard questions, and openness to new ways of thinking about issues are some of the hallmarks of collegiality. An appropriate balance of challenge and support for one another is expected in the program.

### **17.2 TRANSPORTATION IN LOS ANGELES**

Los Angeles is a large city with many transportation challenges. Los Angeles also has a challenging public transportation system. Accordingly, it is highly suggested that you have access to an automobile and a valid driver's license upon your arrival in Los Angeles. If you have any questions or concerns about this issue, please speak with the Program Director prior to the end of the first year.

### **17.3 FILM FESTIVALS/EXTRA-CURRICULAR OFFERINGS**

All students in the program will attend South by Southwest Film and Interactive Festival (SXSW) in the first year of the program (March). The MEIM program will pay for accommodations and festival tickets/badges. Students are responsible for all ground and air transportation, meals, and other incidentals. Some students may have the opportunity to attend Cannes International Festival (Cannes) in France (May, year one). All charges related to Cannes are the responsibility of the student.

In addition, there are several guest speakers and seminars that will be offered throughout the two years you are in the program. It is expected that you will attend as many of these offerings as possible. Attendance at MEIM scheduled events in Pittsburgh should be considered mandatory.

#### **17.4 ATTENDANCE FOR PLANNED EVENTS**

Please note that MEIM leadership takes great effort and expense to secure accommodations and tickets for film festivals and other planned events. Students are given plenty of notice regarding which events are mandatory and which events are optional. In addition, students are given time to decline attendance or participation to these events when possible.

As a result, if for some reason a student fails to show up for a film festival or other planned MEIM event that they were originally scheduled to attend, there will be a charge incurred that will be billed to the student's CMU school account. Extenuating circumstances will be taken into consideration, but those circumstances may or may not remove the possibility of a charge. Please be advised as you proceed through the program.

#### **17.5 LINKEDIN MEIM GROUP**

The MEIM program maintains a private sub-group on LinkedIn's Heinz College group exclusively for current MEIM students, alumni and faculty/staff. This is a convenient place to share information about business developments, including internship and job opportunities, networking events, cultural events, and other relevant MEIM updates. Students are encouraged to join the group at the beginning of year one.

**17.6 EMERGENCY TELEPHONE NUMBERS**

Carnegie Mellon University Police Department 300 South Craig Street, Suite, 199 (Filmore Street Entrance) Pittsburgh, PA 15213	Emergency: (412) 268-2323 Non-Emergency: (412) 268-6232 Email: <a href="mailto:campuspd@andrew.cmu.edu">campuspd@andrew.cmu.edu</a>
University of Pittsburgh Medical Center 200 Lothrop St, Pittsburgh, PA 15213	(412) 647-8762
Pittsburgh Fire Bureau Station 18 5858 Northumberland St Pittsburgh, PA	(412) 255-2863
North Hollywood Police Department 11640 Burbank Blvd, North Hollywood, CA 91601	(818) 623-4016
Providence Saint Joseph Medical Center 501 S Buena Vista St, Burbank, CA 91505	(818) 843-5111
Los Angeles Fire Dept. Station 60 (Tujunga Ave.) North Hollywood CA	(818) 756-8660
University Center Information Desk	(412) 268-2107
MEIM - Pittsburgh Hamburg Hall 1119E, 4800 Forbes Ave. Pittsburgh, PA 15213	(412) 268-6706
MEIM - Los Angeles 4640 Lankershim Blvd. Suite 125, North Hollywood, CA 91602	(818) 980-6346

**18. STATEMENT OF ASSURANCE**

Carnegie Mellon University does not discriminate and Carnegie Mellon University is required not to discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex or handicap in violation of Title VI of the Civil Rights Act of 1964, Title IX of the Educational Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973 or other federal, state, or local laws or executive orders.

In addition, Carnegie Mellon University does not discriminate in admission, employment or administration of its programs on the basis of religion, creed, ancestry, belief, age, veteran status, sexual orientation or in violation of federal, state, or local laws or executive orders.

**19. HANDBOOK INFORMATION**

This MEIM handbook supersedes and replaces all previous policies and procedures including, but not limited to, all memoranda or written policies which may have been issued on the subjects covered in this handbook prior to the revised date on page one. The policies included in this handbook are guidelines only and are subject to change.

*The last update of this document was completed June 18, 2024.*



## 20. ADDENDUM FOR CALIFORNIA PRIVATE POSTSECONDARY EDUCATION ACT OF 2009

Carnegie Mellon University is a private, non-profit institution, approved to operate in California by the California Bureau for Private Postsecondary Education. Approval to operate means compliance with CA state standards set forth in the Ed. Code.

As part of the California Private Postsecondary Education Act of 2009, the Bureau for Private Postsecondary Education (BPPE) requires state-level oversight of private postsecondary schools. As students in the Master of Entertainment Industry Management (MEIM) program reside in the state of California for the second year of the program, the following information is made available to all interested students. <https://www.cmu.edu/hub/consumer-information/>

Any questions a student may have regarding this catalog that have not been satisfactorily answered by the institution may be directed to the Bureau for Private Postsecondary Education at 1747 North Market Blvd. Suite 225, Sacramento, CA 95834, [www.bppe.ca.gov](http://www.bppe.ca.gov), toll-free telephone number (888) 370-7589 or (916) 574-8900 or by fax (916) 263-1894.

As a prospective student, you are encouraged to review this catalog prior to signing an enrollment agreement. You are also encouraged to review the School Performance Fact Sheet, which must be provided to you prior to signing an enrollment agreement.

A student or any member of the public may file a complaint about this institution with the Bureau for Private Postsecondary Education by calling (888) 370-7589 toll-free or by completing a complaint form, which can be obtained on the bureau's internet website, at [www.bppe.ca.gov](http://www.bppe.ca.gov)

### **Accreditation & State Approvals**

Carnegie Mellon University is accredited by the Middle States Commission on Higher Education (MSCHE). Details regarding accreditation & State Approvals can be found here: <https://www.cmu.edu/middlestates/about/index.html>

## 20.1 DESCRIPTION OF PROGRAM AND REQUIREMENTS

MEIM students spend the first year of the program taking core courses at Carnegie Mellon University’s main campus in Pittsburgh, PA. Second year class sessions are offered at the MEIM: Los Angeles Center, located at 4640 Lankershim Blvd. Suite 125, North Hollywood, CA 91602. Second year students in the MEIM program attend courses at the Los Angeles location while working side-by-side with industry professionals throughout the year as full-time interns in a studio or production company. Approximately 20-30 students are enrolled at the Los Angeles campus per year.

A description of the Master of Entertainment Industry Management Program, the requirements for completion including required course load and internship requirements, can be found on the MEIM website:

<http://www.heinz.cmu.edu/school-of-public-policy-management/entertainment-industry-management-meim/index.aspx>

### First Year - Pittsburgh

<p>Fall Semester</p> <ul style="list-style-type: none"> <li>• 42 Units Core</li> <li>• 06 Units - Electives</li> <li>• 48 Units minimum needed</li> <li>• Can take up to 60 units</li> </ul>	<p>Spring Semester</p> <ul style="list-style-type: none"> <li>• 30 units Core</li> <li>• 24 Units – Electives</li> <li>• 54 Units minimum needed</li> <li>• Can take up to 60 units</li> </ul>
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### Second Year - Los Angeles

<p>Fall Semester</p> <ul style="list-style-type: none"> <li>• 46 Units Core</li> </ul> <p>Electives (Can take up to 16 units)</p>	<p>Spring Semester</p> <ul style="list-style-type: none"> <li>• 31 Units Core</li> <li>• Electives (Can take up to 18 units)</li> <li>• You will need at least 5 elective units to get to 36 units to be full-time status</li> <li>• Entire Year 2 = Need 90 units minimum</li> </ul>
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149 Core + 43 Electives = 192 Minimum Units to graduate

## 20.2 DESCRIPTION OF MEIM LOS ANGELES CLASSES

### FALL 2024 CLASS DESCRIPTIONS & OBJECTIVES

#### 93.851 Film Econ Mktg. & Distribution (12 units)

Instructors: Jon Baker

Course Description: This course will provide an overview of the feature film industry, from the filmmaking process to the distribution machine. Although it covers financing, pre-production, production and post-production, it is not a technical production class for filmmakers. Rather, it is a business class in how to manage feature film product as a studio executive or independent producer.

#### 93.852 Production Management (6 units)

Instructors: Ed Lammi/John Harrison

Course Description: This class examines the nuts and bolts of Film and Television production, specifically from the Studio, Network, and Line Production perspective. The syllabus follows the common practices and protocols of the Industry from Pre-Production, through Production and Post-Production, including discussion of the tangential marketing and distribution business sectors as they relate to Production Management. In addition to lecture and discussion format, the class will include participation by guest speakers to cover specific areas of domain expertise. Finally, the course will cover some of the best practices and personal development guidelines that relate to the unique business culture of entertainment, including some historical perspective.

#### 93.853 Digital Innovation and Entrepreneurship (6 units – Core counts as IT Elective)

Instructor: Bob Moczydlowsky

Course Description: This is not a technical course. We won't learn to write code, nor will we produce any creative work. Instead, we'll examine business models, distribution philosophies and the physics of media as they apply to for-profit entertainment companies. We'll start with an overview of Internet history and vocabulary, designed to make students fluent in the business language of the Web. From there, we'll examine Internet business models of the past, present and future, and examine specific case studies of both successes and failures. Once we've established a core understanding of the media landscape, we'll spend a class on the subject of Media Physics and the way quality content both creates and destroys business opportunity, regardless of – and sometimes in spite of – the marketing campaigns it's associated with. We'll discuss how this disruption creates significant business opportunity – especially for artists and artists' business partners. Why license copyrights when there are emerging tools that provide many of the functions previously controlled by studios and labels? But this opportunity isn't limited to just artists – Independent Entrepreneurs will also shape a large portion of the future of entertainment. We'll conclude the class by talking about the process of securing angel and venture funding, and we'll also cover how to organize a business for success.

93.871 TV Bus & Legal Affairs (9 units)

Instructor: Adam Hime

Course Description: The goal of this class is to provide students with a practical understanding of how a typical major studio Television Business & Legal Affairs department fits into today's Production and vertically integrated Studio/Network environment. In addition, students will become acquainted with basic deal terms, contractual provisions utilized in the television industry, as well as practical advice on negotiation tactics & skills and reading and understanding budgets.

93.876 TV Marketing & Advertising (6 units)

Instructor: Erin Franzman

Course Description: This course is designed to provide a comprehensive look at one of the most powerful mediums in existence today: Advertising & Marketing on broadcast and cable television. Focus will be given to the marketing of television shows and networks. How digital technology is changing the television landscape for businesses, viewers and marketers. The history of advertising on television and what the future of the industry might be will also be addressed. The class will encompass both the marketing of television to the viewer and how advertisers are finding new ways to use television to reach viewers.

93.879 Navigating the Industry (3 units)

Instructor: Paula Wagner

Course Description:

The course will be an in-depth analysis of the entertainment industry, specifically, the movie and theater businesses and transformations in the digital era. The class will highlight talent representation (agents, managers, lawyers, etc.), film packaging, the studio system, and the transitions between screen to stage with some attention to Broadway theatre. The class will indoctrinate participants into the language and dynamics of the industry through the eyes of an insider to help prepare students for the practical realities of entering, building, and sustaining a career in the entertainment field. In other words, this class focuses on examining the basic 'nuts and bolts' of the industry and the changing landscape due to the rapidly evolving distribution models.

93.889 Capstone I (3 units)

Instructor: Dan Green

Advisors: Anna Andree, Keith Eich, Alison Emilio, Scott Garner, Dan Green, Kevin Stein

Course Description: The Capstone Project is a two-semester applied research project that represents the final requirement of the Master of Entertainment Industry Management (MEIM) Program. The Capstone provides the opportunity for students to apply the sum knowledge and skills gained from the MEIM program to real world issues facing the entertainment industry. Working in teams, and in consultation with industry professionals, students will define, outline and deliver an in-depth examination of a specific research topic, fulfilling a series of deliverables over the course of the project, and adhering to established research project formats and guidelines.

93.857 The Business of Gaming (4 units) – Elective

Instructor: Holly Newman

Course Description:

This class will focus on the business aspects that relate to the gaming industry. This industry has grown quickly in the last 10 years to overtake theatrical motion pictures as a leading source of commercial entertainment – in content development, distribution and the licensing of its IP.

The course will focus on the ways in which its creative and business practices are both unique, and also share common characteristics with other forms of screen-based entertainment.

The course will focus on the following key areas:

- The publishing business model, and how Games evolved from and relate to software distribution. Covered material will include: licensing agreements, the development and ownership of Intellectual Property, and the impact of software piracy on business models.
- The game publishers, and an overview of the key companies and competing business strategies, including game genres, key titles/franchises, management of developer relationships, and the publishers' relationships with licensors and licensees (primarily vis-à-vis the motion picture business).
- The lexicon and how to effectively communicate with buyers and sellers of Intellectual Property.
- The production process, and how to reconcile with film and television production timelines and milestones. Covered material will include: the game development process from inception through release – including visual and character development, level design, play testing, level testing, coding, game engines, animation & motion capture.
- The future of the game business and an overview of current trends including social games, cloud distribution, iOS/Android and how they impact rights allocations and revenue streams.

93.837 Artist Development in the Music Industry (3 units) – Elective

Instructor: Benjy Grinberg

Course Description: The music industry has changed drastically over the last 15 years. How music is produced, distributed and consumed has gone through seismic changes. Therefore, the way that artists develop and reach their fans has also evolved.

This course will give insight and knowledge as to how the music industry works today. It will examine the various dimensions of artist development including talent discovery, social media, putting together an artist's team, making independent and major label albums, streaming, expanding artist fan bases, touring, and merchandising. The class will also touch upon the changing expectations and career trajectory of the musical artist. This class will be of great help to those interested in being an artist, managing an artist, working for or starting a label, or simply understanding the music business better.

93.864 Music Monetization & Song Royalties (3 units) – Elective

Instructor: Olivia Barton

Course Description: A multitude of contradictions and complications exist within the music industry. According to the Recording Industry Association of America, music revenues in 2016 were the highest they've been in over eight years with the largest year-over-year percentage increase in over 18 years. However, these numbers do not reflect the tumultuous waters in

which those connected to the music industry find themselves today. While streaming services have increased accessibility, the issues of piracy and artist control are of grave concern. This course will examine how the record labels and publishers are responding to the changing economy of the music industry. Discussions will address the big players in the music industry (Sony Music, Universal Music, Warner Music Group, Sony/ATV, & UMPG) as well as indie record labels' business strategy, how legal aspects of the music industry effect artists, publishers, and consumers (digital rights management, etc.), as well as the ever-increasing reliance on streaming and the technical companies providing music services. Topics to be examined include copyright law, label and publishing agreements with artists, and backend monetization of assets.

### 93.859 Fandom in Music and the Media (3 units) – Elective

Instructor: Alisa Ben

Course Description: Fandom and all forms of entertainment are inextricably tied. From the earliest development of human expression to the technologically diverse present: visuals, performances, games, music, fiction, and play of all kinds, have catered to and been funded/supported/disseminated/worshipped/appropriated by FANS (casual or rabid). Music, Sports, Politics (increasingly), Movies, TV/Streaming, Video Games, Social Media Platforms themselves, are all arguably the most influential methods in history for exposing audiences to new artists/celebrities/micro-celebrities/ideas/heroes/villains. Fandom has become more than content consumption. The role of FANS can, and often does, serve as the key driver of entertainment business and creative decisions.

The goal of this class is to provide students with the broadest understanding of the landscape of FANDOM today and historically, as well as the role it plays from the POV of decision makers and those that finance and produce content on the corporate level. We will also focus on the resources and processes for discovering artists/influencers/leaders/celebrities, mobilizing FANS as business strategies, navigating the process of FAN engagement effectively, satisfying business and legal affairs protocol in doing so, and pushing the role of FANDOM (and artists themselves) in broad strategic thinking beyond the final produced project.

### 93.882 AI and the Future of Creativity in Entertainment (3 units) – Elective

Instructor: Dan Green & Kevin Stein

Course Description: This course will examine the issues that often arise within an industry that places corporate profits and artistic freedom above all else. Through practical application as well as class discussion, we will highlight how AI is transforming the entertainment industry. In particular, the course will address how quickly AI is disrupting traditional business models, intellectual property rights, and studio production as well as creating tension between creative artists, executives, talent, trade unions, agencies, and audiences.

## SPRING 2025 CLASS DESCRIPTIONS &amp; OBJECTIVES

93.855 Intellectual Property (6 units)

Instructor: Adam Hime

Course Description: The goal of this class is to provide students with the solid underlying principles of intellectual property laws affecting and regulating the protection and distribution of entertainment content. The class covers all of the basic legal concepts required for a complete picture of intellectual property law but is aimed at non-lawyers and non-law students.

93.856 Business Development (6 units)

Instructor: Michele Smith

Course Description: Business development uses the lenses of strategy and commercialization to identify opportunities for expansion and growth. It relies heavily on its functional cousins - Sales, Marketing, Finance and Corporate Strategy. Each functional area will be explored within the various sectors of the entertainment industry through class discussions, assignments and a final project. In this class, we will focus on business development in media and entertainment. The class will examine how entertainment executives leverage product development, sales and marketing opportunities to facilitate growth. We will discuss how to effectively be an entrepreneur while navigating relationships inside and outside the corporation. Students will explore the development of business models, alternative monetization strategies, and develop a POV on investment/funding as well as mergers and acquisitions (M&A).

93.858 Market Research in Entertainment (3 units)

Instructor: Kevin Yoder

Course Description: This course provides a comprehensive introduction to marketing research as used across several entertainment industries (film, television, and videogaming). The course will discuss key concepts, processes, and techniques, as well as their applications. The goal is to overview with students the fundamentals of good research practices used by business enterprises, regardless of size (start-up or established) and regardless of vertical.

The course is aimed at a user of research, rather than the one responsible for determining the scope and direction of research activities. The goal is that by the end of this class students will be well-informed and effective user-consumers of research at any company or occupation they go on to after graduation. Students will learn that the techniques of research design, data collection, and data analysis play an important role in the work of a marketing department, especially in regard to establishing strategy and monitoring feedback from the marketplace and consumers. This course focuses on providing students with the tools they need to understand and evaluate research findings they will likely encounter as entertainment industry executives. The aim is to develop an appreciation for the potential contributions and limitations of marketing research.

93.869 Television Economics (6 units)

Instructor: Pat Quinn/Francois Vallerian

Course Description: The goal of this class is to provide students with the solid economic and structural fundamentals of the U.S. television industry, from real life development and production and financing paradigms to business and marketplace fundamentals (with a bit of practical theory thrown in for good measure).

93.890 Capstone II (9 units)

Instructor: Dan Green

Advisors: Anna Andree, Alison Emilio, Scott Garner, Dan Green, Kevin Stein

Course Description: The Capstone Project is a two-semester applied research project that represents the final requirement of the Master of Entertainment Industry Management (MEIM) Program. The Capstone provides the opportunity for students to apply the sum knowledge and skills gained from the MEIM program to real world issues facing the entertainment industry. Working in teams, and in consultation with industry professionals, students will define, outline and deliver an in-depth examination of a specific research topic, fulfilling a series of deliverables over the course of the project, and adhering to established research project formats and guidelines.

93.854 Film Acquisitions (3 units) – Elective

Instructor: Lakshmi Iyengar

Course Description: Independent film is a term loosely used to mean many things. While the term is often times used to label a genre, it is also a financing method. An independent film can cost \$300 and be constructed on a home computer or it could cost \$200 million with a studio paying a surplus on top of the budget to distribute it. We will dive in to both the genre and its financing methods, and discover how this is part of a business model that consumers may never know about. But it is one of the most important sectors that initially discovers almost every piece of acting and filmmaking talent; and promotes it to the next level. The glamorous and not so glamorous world of film festivals are where studios and distributors scour for up-and-coming talent, where actors go to gain credibility and where has-beens turn to resurrect careers. Building on the world of festivals, we will look at how an independent movie gets financed, packaged, produced and sold to domestic and foreign distributors. This class will explore the various sources of the film product and follow it through distribution, on both a studio and independent level.

93.872 Music Supervision (3 units) – Elective

Instructor: Bonnie Greenberg

Course Description: The course defines the role of the music supervisor, who draws on combined resources of the film and music communities to marry music and moving images. The course is intended to lead students to a better understanding and appreciation of the use of music in the filmmaking process. Lectures, assignments, presentations and discussions with guest speakers present the principles and procedures of music supervision.



93.866 Creative Producing (6 units) – Elective

Instructor: Mark Christopher

Course Description: Creative Producing: Visuals and Vision. This course focuses on the main interpreters of the script (producers, directors and their teams) from the POV of an instructor who has worked primarily as a director and writer with a strong producerial hand. Topics will include choice of material, and early creative discussions with an emphasis on visual language, story, character and the various components used to bring an idea from page to screen. Also examined will be the producer and director's function as it relates to other key positions within the entertainment industry. Classroom participation is mandatory in this course (presenting projects, defending them and critiquing others).

93.873 Film Exhibition (3 units) – Elective

Instructors: Miguel Mier/Alberto Alcaraz

Course Description: I. Rationale: Understanding the Film Exhibition Industry is key to conceptualize, create and launch content. The economic rationale is the driver behind the films, which maintain the industry profitability and hence-forth guarantee the sustainability of the sector over time.

II. Course Aims and Objectives: At the end of the course, students will be able to understand and identify the critical factors in the success of film exhibition management in order to make the best decisions based on the economic rationale.

The course will allow students to contribute value to any of the three perspectives of the film industry's value chain: production, distribution or exhibition.

93.878 Branded Entertainment (3 units) – Elective

Instructor: Shelley Ong

Course Description: Price is not the only measure of value for consumers. Perceived value is derived from a combination of characteristics including quality, reliability, positive or negative associations, and memorability, to name a few. These are not only factors that impact a consumer's purchase decision, but also qualities that make up a brand. Strong brands, then, build equity and real financial value for companies. Building and maintaining a brand is a philosophical and tactical undertaking.

In this course, students will build a foundational understanding of branding through class discussions, articles and case studies. Students will examine the difference between brand and marketing/communications as well as the importance of brand as business and its application to global branding. They will also examine how a company finds and communicates value proposition relative to their competitors, users and communities at large. Students will consider the impacts of brand valuation as well as the spectrum of branded content. Class participants will look at how branded content is evolving with new technology and communications methods. Students will then be able to apply this groundwork to various marketing and communications tactics globally and across all media platforms, both traditional and modern.

### 93860 What Makes Us Play? The Craft of the Video Game (4 Units) – Elective

Instructor: Cheryl Platz

This course delves deep into the art of creating and shipping video games. The class exams the fundamental principles of game design and the realities of shipping discrete gaming products into the dynamic online marketplace. The class will also look at how social gaming manifests in today's market, and what it means to take a game across gaming platforms. The course will assess contemporary gaming platforms and analyze the requirements for achieving multi-platform compatibility. The course will also explore the implications on user experience stemming from the core capabilities on consoles, PCs, mobile phones, and extended reality devices.

## **20.3 INFORMATION REGARDING THE FACULTY AND THEIR QUALIFICATIONS**

Heinz Faculty members are experts in their field of study. You may find information about those who teach in the first year of the program at the following website:

[http://www.heinz.cmu.edu/faculty-and-research/faculty-profiles/index.aspx?search\\_type=a&from\\_letter=A&to\\_letter=A](http://www.heinz.cmu.edu/faculty-and-research/faculty-profiles/index.aspx?search_type=a&from_letter=A&to_letter=A)

For information and bios about those who teach in Los Angeles or who teach MEIM specific classes, please refer to the following website page.

<https://www.heinz.cmu.edu/programs/entertainment-industry-management-master/meim-faculty>

Listed below is the list of current faculty members, their non-teaching job titles, their academic qualifications, and a link to their full bios that can be found on the MEIM website.

#### Aguilar, Alberto (Film Exhibition)

Process and Continuous Improvement Deputy Director, Cinépolis

BA Industrial Engineering, Morelia Tech Institute

MS Quality and Productivity Systems, Monterrey Tech

MBA IPADE Business School

<https://www.heinz.cmu.edu/faculty-research/profiles/alcarazaguilar-alberto>

#### Andree, Anna (Capstone Advisor)

Director of Research, Universal Studio Group/NBCUniversal

Bachelor in Theatre Arts, Marymount Manhattan College

Master of Entertainment Industry Management, Carnegie Mellon University

<https://www.heinz.cmu.edu/faculty-research/profiles/andree-anna/>

#### Baab, Johnny (Live Music: Touring and Revenue Streams)

Guitarist, Musical Director, Producer, Member of Ghost Hounds

<https://www.heinz.cmu.edu/faculty-research/profiles/baab-john/>

Baker, Jonathan (Film Economics, Marketing & Distribution)

Producer, JB Productions (Producer: Sylvie's Love, Basmati Blues, Crown Heights, The Banker)

BA, University of Michigan in music, philosophy and religious studies

<https://www.heinz.cmu.edu/faculty-research/profiles/baker-jonathan>

Barton, Olivia (Music Monetization and Song Royalties)

Associate Director, Sync Licensing at Sony Music Entertainment

BA, Marketing, the University of Oklahoma

Master of Entertainment Industry Management, Carnegie Mellon University

<https://www.heinz.cmu.edu/faculty-research/profiles/barton-olivia>

Ben, Alisa (Fandom in the Media)

SVP and Head of Analytics, Canvas Worldwide

BA, Journalism & Broadcasting, Oklahoma State University

MBA, New York University

<https://www.heinz.cmu.edu/faculty-research/profiles/ben-alisa>

Christopher, Mark (Creative Producing)

Writer, Director of Film, TV, Stage (54: Directors Cut, Real Life: the Musical)

BA, University of Iowa

MFA, Columbia University

<https://www.heinz.cmu.edu/faculty-research/profiles/christopher-mark>

Emilio, Alison (Capstone Advisor)

Executive Director, WORD Theatre/ Past Director, ReFrame (Sundance Institute & Women in Film)

Past -Director, ReFrame (Sundance Institute & Women in Film)

BA, Ryerson University (Toronto) – Film & Photo Arts

MS, UCLA – Landscape Architecture

<https://www.heinz.cmu.edu/faculty-research/profiles/emilio-alison>

Franzman, Erin (TV Marketing)

Vice President, Content Social Strategy, CBS

Bachelor of Science, Cornell University

<https://www.heinz.cmu.edu/faculty-research/profiles/franzman-erin>

Garner, Ph.D., Scott (Capstone Thesis Advisor)

Executive Consultant at Conqueror Media

BA, Emory University, English & American Literature and French Studies

MA, Columbia University, Communication & Education

PhD. Fielding University, Media Psychology

<https://www.heinz.cmu.edu/faculty-research/profiles/garner-scott>

Green Ph.D., Daniel T. (Script and Story Analysis; AI in Entertainment; Capstone Thesis Advisor)

Program Director, CMU, Entertainment Industry Management  
BA, Southern IL University-Carbondale, Acting and Directing, Minor in Cinematography  
MFA, Carnegie Mellon University, Directing, Drama  
Ph.D. Azusa Pacific University, Higher Education and Organizational Leadership  
<https://www.heinz.cmu.edu/faculty-research/profiles/green-daniel>

Greenberg, Bonnie (Music Film Supervision)

President/Music Supervisor/Producer, Ocean Cities Entertainment  
BA, Political Science/Literature, University of Denver  
MA, Clinical Psychology, Antioch College  
JD, Southwestern University School of Law  
<https://www.heinz.cmu.edu/faculty-research/profiles/greenberg-bonnie>

Grinberg, Benjy (Artist Development in the Music Industry)

Founder and President, Rostrum Records  
BA, magna cum laude, International Relations, University of Pennsylvania  
<https://www.heinz.cmu.edu/faculty-research/profiles/grinberg-benjy>

Harrison, John (Production Management)

Filmmaker, Bean Boy, Inc. (Writer: Residue, Netflix miniseries, and Creepshow anthology series)  
BS, Emerson College  
MFA, Carnegie Mellon University  
<https://www.heinz.cmu.edu/faculty-research/profiles/harrison-john>

Hime, Adam (TV Legal & Business Affairs; Intellectual Property)

Senior VP, Business & Legal Affairs and Associate General Counsel, Endeavor Content  
B.A. Political Science, University of CA, Los Angeles  
J.D. University of Southern California  
<https://www.heinz.cmu.edu/faculty-research/profiles/hime-adam>

Hollin, Lee (TV Marketing)

SVP, Television and Head of Current Programming, Lionsgate  
Bachelor of Theatre Arts, University of Pittsburgh  
Master of Entertainment Industry Management, Carnegie Mellon University  
<https://www.heinz.cmu.edu/faculty-research/profiles/hollin-lee>

Iyengar, Lakshmi (Film Acquisitions)

Agent, Motion Picture Media Finance, Creative Artists Agency  
Past Executive Vice President, Head of Production, Minor Realm  
Past Vice President, Sony Pictures Worldwide Acquisitions  
BA in Theater and Minor in Italian, UCLA  
Master of Entertainment Industry Management, Carnegie Mellon University  
<https://www.heinz.cmu.edu/faculty-research/profiles/iyengar-lakshmi>

Lammi, Ed (Production Management)

Executive Vice President, Production, Sony Pictures Television  
BA English, Penn State University

<https://www.heinz.cmu.edu/faculty-research/profiles/lammi-ed>

Bohr, Ashleigh (Film Economics, Marketing & Distribution)

Vice President, Global Content & Strategy, NRG  
B.A. Communication and Arts Management, University of Wisconsin  
Master of Entertainment Industry Management, Carnegie Mellon University

<https://www.heinz.cmu.edu/faculty-research/profiles/marzynskiboehr-ashleigh>

Mier, Miguel (Film Exhibition)

Chief Operating Officer, Cinépolis  
BS in Economics, ITESM

MS in Management, Stanford GSB, 2007

Double Degree MS in Information Technology, Heinz College at Carnegie Mellon University/ITESM  
2011.

<https://www.heinz.cmu.edu/faculty-research/profiles/mier-miguel>

Moczydlowsky, Bob (Digital Innovation & Entrepreneurship)

Managing Director, Music at TechStars  
BA, University of Kansas

Master of Entertainment Industry Management, Carnegie Mellon University

<https://www.heinz.cmu.edu/faculty-research/profiles/moczydlowsky-bob>

Newman, Holly (Business of Gaming)

CEO, Liquid Entertainment

Past EVP of Publishing at Crave Entertainment

<https://www.heinz.cmu.edu/faculty-research/profiles/newman-holly>

Ong Teshima, Shelley (Branding)

Director, Brand Marketing at Lyft

Bachelor of Commerce, University of British Columbia Double Specialization in Marketing and  
International Business

<https://www.heinz.cmu.edu/faculty-research/profiles/teshima-shelleyong>

Cheryl Platz (What Makes Us Play? The Craft of the Video Game)

Director of User Experience, Player Platform at Riot Games

Bachelor of Science, Computer Science, Human-Computer Interaction, Carnegie Mellon  
University

Quinn, Pat (TV Economics)

Partner/Manager: Quinn Media Management

B.A., Bennington College

M.F.A., Yale Drama School

<https://www.heinz.cmu.edu/faculty-research/profiles/quinn-pat>

Andrew Saul (Production Finance)

Sr. Vice President of Production Finance, Sony Pictures Television

B.A., Cinematic Arts, University of Arizona

MBA, University of Southern California

<https://www.heinz.cmu.edu/faculty-research/profiles/saul-andrew/>

Skopov, Emily (Introduction to Television Writing)

Writer/Producer: (Xena: Warrior Princess, Andromeda, Pacific Blue, Novel Romance)

BA, English Literature, Columbia University

MFA, Screenwriting, UCLA

<https://www.heinz.cmu.edu/faculty-research/profiles/skopov-emily/>

Smith, Michele (Business Development)

Vice President of Legacy and Estate Brand Management, Concord

Executive Producer, *Billie*

BA in Liberal Arts, Simon Fraser University, British Columbia

<https://www.heinz.cmu.edu/faculty-research/profiles/smith-michele/>

Stein, Kevin (Capstone Advisor/AI and the Future of Creativity in Entertainment)

Principal, Kevin Stein Consulting

BA, Boston University

Swathmore College

Harvard University

<https://www.heinz.cmu.edu/faculty-research/profiles/stein-kevin>

Kerry Stranman (Branded Entertainment)

President, Kerry Stranman Insights +Strategy

<https://www.heinz.cmu.edu/faculty-research/profiles/stranman-kerry/>

Francois Vallerian (TV Economics)

Vice President of Research, Paramount Global Content Distribution

Masters in Project Management, Skema Business School

<https://www.heinz.cmu.edu/faculty-research/profiles/vallerian-francois/>

Wagner, Paula (Navigating the Practical Realities of the Entertainment Industry)

Producer/Owner, Chestnut Ridge Productions (Mission Impossible, War of the Worlds, Marshall,

Pretty Woman: The Musical)

BFA, Drama, Carnegie Mellon University

<https://www.heinz.cmu.edu/faculty-research/profiles/wagner-paula>

Kevin Yoder (Market Research)

Executive Vice President, Theatrical Strategy, National Research Group

BA, University of Notre Dame, Liberal Arts

MFA, University of Southern California, Peter Stark Producing Program  
J.D. University of Southern California, Gould School of Law  
<https://www.heinz.cmu.edu/faculty-research/profiles/yoder-kevin/>

## 20.4 UNIVERSITY POLICIES & EXPECTATIONS

It is the responsibility of each member of the Carnegie Mellon community to be familiar with university policies and guidelines. In addition to this departmental graduate student handbook, the following resources are available to assist you in understanding community expectations:

- The Word/Student Handbook: <http://www.cmu.edu/student-affairs/theword/index.html>
- Academic Integrity Website: <http://www.cmu.edu/academic-integrity>
- University Policies Website: <http://www.cmu.edu/policies/>
- Graduate Education Website: <http://www.cmu.edu/graduate/policies/index.html>
- The WORD is Carnegie Mellon University's student on-line handbook and supplement to the department (and sometimes college) handbook. The Carnegie Mellon Code can also be found on-line at: <https://www.cmu.edu/student-affairs/theword/code/index.html>

## 20.5 HEINZ COLLEGE APPLICATION PROCESS

Before applying, please carefully review the application process and admission requirements for the Master of Entertainment Industry Management Program.

## 20.6 MEIM ADMISSIONS REQUIREMENTS - OVERVIEW

The MEIM program is looking for dynamic, motivated critical thinkers who are drawn to the ever-changing entertainment field. The MEIM program seeks leaders who want to hone their strategic and entrepreneurial skills, and build a strong business foundation to help realize their career goals in the entertainment industry.

MEIM applicants should be interested in how screen-based entertainment is produced, developed, packaged, financed, marketed and distributed. However, MEIM students come from a wide variety of undergraduate backgrounds. While the program welcomes graduates of film, TV and communications programs, students have come to the MEIM program with liberal arts degrees in literature, sociology or history. Business, social science, marketing degrees, fine arts, theater, or even music programs are great preparations for a MEIM degree. In short, because the entertainment industry draws on so many different disciplines, the MEIM program believes in assembling a student body with diverse and synergistic backgrounds.

The MEIM program also welcomes individuals who have completed their Bachelor's degree and spent the past few years pursuing their careers – either in entertainment, or in other fields. Having some professional experience under one's belt can provide an added level of focus, and such students also do well in the program.

For more information on the MEIM student body, including demographics and test scores, view the [class profile](#).

Because of the quantitative nature of Heinz College graduate programs, the faculty requires that all incoming students have a solid quantitative foundation prior to enrollment at Heinz. Since successful applicants come from diverse academic backgrounds, the College offers the Quantitative Skills Summer Program (QSSP) to prepare incoming students who did not previously complete college-level courses like advanced algebra, pre-calculus and/or statistics.

The Admissions department invites all interested candidates to contact the college directly with any questions about qualifications, eligibility or any other topic or concern. Admissions' representatives will work closely to help MEIM candidates successfully complete an application to the Program. [Admission Process and Required Application Materials-MEIM Program.](#)

### **20.7 VERIFICATION REQUIREMENT FOR ALL ENROLLING STUDENTS**

We are committed to ensuring the integrity of our admissions process and the reputation of our educational programs. We also want to protect and enhance the value of the degrees that we confer. The purpose of the background check is to protect all stakeholders of our programs (students, faculty, staff and alumni) from those who would falsify their backgrounds to gain an unfair advantage in the admissions process. We have made the decision to implement an independent verification process of all application materials for any master's student enrolling in the Heinz College. We believe the verification will support our efforts to ensure integrity throughout the program. Upon admission, you will receive more details about this process.

### **20.8 TRANSFER AND ARTICULATION AGREEMENTS**

The MEIM program has not entered into an articulation or transfer agreement with any other college or university.

### **20.9 CREDIT FOR PRIOR COURSES**

In general, the Heinz College does not give credit toward graduation for courses taken prior to entering the Heinz College program. The MEIM program does not award credit for prior work at a job or internship, however, the admissions committee does look upon previous work in a favorable light. Even if you do receive prior credit, however, you must still pay tuition for the number of full-time semesters required by your program in order to receive a degree.

### **20.10 STUDENTS ON F-1 VISAS AND COURSE LOADS**

Regulations governing F-1 students limit how many online/distance courses an F-1 student may take and still be considered to be enrolled full-time and maintaining status. F-1 students are required to be enrolled full-time each semester (36 units or the minimum required for making normal progress towards the completion of the degree). Students in F-1 status cannot take more than a single online/ distance course (either a mini or a full-semester) in any given semester. Immigration does not consider courses that require physical presence on campus to be distance education/online even if the delivery mode is via distance.



CMU does not provide Visa Services. Our Office of International Education (OIE) issues the I-20 document to enrolling students and counsels' students on immigration-related issues before, during and after enrollment at the university.

## 20.11 ENGLISH LANGUAGE PROFICIENCY EXAM

All classes are taught in English. No instruction will occur in any language other than English.

The English language proficiency of domestic students is measured during the admission process through their admission essay/ statement of purpose (required of all applicants to the MEIM program) as well as the optional review of the verbal and writing scores on the GRE or GMAT. In addition, MEIM applicants are provided the options to complete a video interview or a video essay as part of their admission packet. Additionally, many MEIM applicants are required to complete a face-to-face interview or complete a virtual interview with a member of the admissions committee (via Zoom, Skype, or other similar technology). This combination of various methods of communication gauge the students' verbal and written language skills.

If your native language (mother tongue) is *not* English, you are required to submit an official score report from the [TOEFL](#) or [IELTS](#). **The only exceptions are for students who have worked or studied for five or more years in Australia, Botswana, Canada, Ghana, Ireland, Kenya, Lesotho, Malawi, Namibia, New Zealand, Nigeria, South Africa, Swaziland, Tanzania, Uganda, United Kingdom, United States, and/or Zambia.** Earning a bachelor's degree in these countries does not automatically qualify you for this waiver due to the five-year minimum requirement. **Your scores must be submitted directly to us by Educational Testing Service (ETS).** The **recommended TOEFL score is 25 on each section** of the Internet-based test. We strongly recommend that you take the TOEFL or IELTS at least one month prior to the application deadline.

You may submit scores from up to four valid TOEFL or IELTS exam dates. If you have taken the exam more than once, **Heinz College will use the highest score verified in each section in reviewing your application for admission.** For every score you wish to include with your application, you must report the exam date(s) and submit the official score report(s). We will not accept exam scores for test dates that are not listed on the application.

### TOEFL (IBT preferred)

The **recommended TOEFL score is 25 on each section** of the Internet-based test (or 620 on the paper-based test and 260 on computer-based test).

The **minimum TOEFL scores required to apply** for admission to any of Heinz College's graduate degree programs are:

Reading: 22    Listening: 22    Speaking: 18    Writing: 22

For more information on the TOEFL or to register, please [visit the ETS TOEFL website](#).

### IELTS

If you choose to take the [International English Language Testing System \(IELTS\)](#) in place of the TOEFL, we require that you take the "Academic" format of IELTS. **The recommended IELTS score**

**is 7 overall and 7 in each band.** The **minimum IELTS scores required to apply** for admission to any of Heinz College's graduate degree programs are:

Listening: 6.5 Reading: 6.5 Writing: 6.5 Speaking: 6.0 Overall Band: 6.5.

For more information on the IELTS or to register, please [visit the IELTS website](#).

In addition to TOEFL and IELTS, Heinz will now accept the online [Duolingo English Test](#) for applicants for whom English was not their first language. These tests include a proficiency composite score, section subscores, video interview, and writing sample which are shared with Heinz College when you send your results. Certified results are available within 48 hours of the test session.

We will accept results from the current version of the [Duolingo English Test](#) on the 160 point scale with subsection scoring (new as of July 2020). **Your scores must be submitted directly to “Carnegie Mellon University – Heinz College of Information Systems & Public Policy” by Duolingo. We receive all Duolingo English Test scores electronically. The recommended Duolingo English Test score is 120 overall (see below for recommended scores in each subsection).**

The **minimum Duolingo English Test scores required to apply** for admission to any of Heinz College's graduate degree programs are:

Literacy: 105 (recommended = 115) Comprehension: 115 (recommended = 125)

Production: 70 (recommended = 100) Conversation: 95 (recommended = 105)

Overall: 105 (recommended = 120)

## 20.12 LOCATION PROFILE

Carnegie Mellon University's H. John Heinz III College and The College of Fine Arts operates a satellite location in Los Angeles, California, as a part of the Master of Entertainment Industry Management program (MEIM). The Los Angeles portion of the MEIM program is located in the city of North Hollywood in Los Angeles County. The location consists of a 6,034 square foot suite of offices in a six-story professional office building shared by other tenants, located at 4640 Lankershim Blvd., Suite 125, North Hollywood, CA 91602. The cross street is Hortense.

The suite of offices includes a 20-seat classroom with a TV and overhead projection capability, a 30-seat classroom with two 70-inch televisions and a 45-inch confidence monitor, and a 50-seat classroom with four 70-inch televisions. All classrooms have multiple white boards and moveable chairs/tables. Additionally, most teachers project power point slides on the screens and the use of the white boards is common. There are two conference rooms for student use with moveable chairs/tables. One of the conference rooms has dedicated video conference capabilities. There is a large screening room with a 75-inch television and multiple couches/sitting areas. There is a student computer office, a kitchen, a library with over 1000 DVD's and books and a reading area.

There is a courtyard directly outside of the MEIM entrance between the building and the parking garage. The courtyard has a seating area and planted shrubbery.

## 20.13 HOUSING

The CMU MEIM Center in Los Angeles does not offer on-campus housing or off-campus housing services. Students need to find their own housing. There are many apartment complexes and/or room rentals within a commutable distance from the campus. Housing costs vary and most students choose to have roommates. The approximate cost of housing varies depending on the area of the city (anywhere from \$1,200 – 2,500 for a one-bedroom apartment). There are several websites to help students find costs:

<https://www.rentcafe.com/average-rent-market-trends/us/ca/los-angeles/>

<https://la.curbed.com/2018/6/21/17477888/los-angeles-apartments-renters-guide>

While the MEIM office cannot act as a real estate agency or rental broker for you, we are happy to offer our advice or suggestions on locations that may be of interest to you. In March of the first year of the program, MEIM leadership offers a workshop on housing which includes advice from past students and information on the popular neighborhoods that students often live. Listed below is some helpful information regarding housing.

### **MEIM Recommended areas (just a few)**

- Around MEIM, Disney, Warner Bros-Discovery, Universal Studios, Radford (CBS) Studios, DreamWorks Animation
  - Burbank/ Glendale/ Toluca Lake/ Studio City / North Hollywood (South of Burbank Blvd).
- Around Paramount Studios, Raleigh Studios, Netflix, Sunset Gower Studios, Jim Henson Studios, Dolby Theatre, Hollywood Agencies, Post Production Houses:
  - Hollywood/ Los Feliz/ Silver Lake/ Atwater Village/ Hancock Park/ West Hollywood/Koreatown
- Around a majority of Talent Agencies & Management Firms:
  - West Hollywood/ Beverly Hills/ Beverly Hills Adjacent/ Beverlywood
- Around Sony Studios, Fox Studios, Amazon Studios:
  - Culver City (*far* from MEIM)/ West Los Angeles/ Palms/
- Other Areas:
  - East of MEIM: Eagle Rock/ Pasadena
  - West of MEIM: Van Nuys/ Sherman Oaks/ Encino
  - North of MEIM: Montrose/ La Canada

### **When to find a place:**

You can find an apartment within a few days if you do some internet homework first. LA is a transient town, so folks move a lot. Be patient and drive around the neighborhoods first. Note the parking situation. Parking is going to become a major conversation for you. Make sure you (and friends) have access to safe, well-lit parking.

Here is a link to find out more information including full statistics about the various LA areas:

<http://projects.latimes.com/mapping-la/neighborhoods/>

### **Cost of Living & Apartment Prices**

If you want to live in the City of Angels, you have to pay a premium. The overall cost of living here is 33% above the national average, with housing costs tending to be among the most expensive in the nation. In the city of Los Angeles, the median cost for apartment rentals is over \$1500 per month per person and can be quite a bit more depending on where you live. If you share, students can get a better place that tends to be cheaper. Expect to pay even more for apartments in places like Santa Monica, Malibu and other upscale communities. Last year students' rent ranged from \$1100 to \$2700

### **20.14 ATTENDANCE POLICIES**

Students in the Master of Entertainment Industry Management program are expected to attend all classes outlined in a course syllabus as part of their degree. All absences must be approved and arranged with the course professor on an individual basis. Please note that the leadership of the MEIM program do not support excessive course absences for job interviewing, networking events, screenings, or internship conflicts. Excessive course absences may influence a student's ability to pass a course and/or complete their degree.

### **20.15 STUDENT RECORDS**

Heinz College's MEIM program maintains records of the name, address, e-mail address, and telephone number of each student who is enrolled in the program in its student information system and a secure folder for use by Academic Services.

#### Student Record Retention Policy

The policy of Carnegie Mellon University is to ensure the safety, accessibility, confidentiality, and good condition of the permanent record of every Carnegie Mellon student, past and present.

Carnegie Mellon University (CMU), established in 1900, holds all permanent records of our students (current and former) in the University Registrar's Office. We maintain original paper records in an offsite secure climate-controlled underground storage facility along with a microfilmed copy of each record. In addition, a copy of microfilmed records also resides in the University Registrar's Office in Pittsburgh, PA. This includes all students globally, include those students studying at our California teaching location and instructional sites. CMU has established the University Registrar's Office as the official data steward of all student records.

#### Historical Records 1906-1989

For every student enrolled at Carnegie Mellon University as a new or continuing student prior to the fall semester, 1989, and dating back to 1906, the University Registrar's Office of Carnegie Mellon University maintains a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not within the student's official transcript. The official transcript provides brief personal information to identify the student as unique. It contains courses, units and grades; semester and cumulative grade point averages; all degrees earned; transfer credit or advanced placement and dean's list indications.

The University Registrar's Office has established and maintains within a microfiche copy of good, readable, and reproducible quality of the student's permanent record in a secured records unit. A secondary permanent microfilm copy of all records will be maintained in good condition in the climate-controlled, fire-proof, limited-access security at an offsite facility.

#### Modern Records 1989-Current

For every student enrolling at Carnegie Mellon University as a new or continuing student beginning in fall semester, 1989, the University Registrar's Office of Carnegie Mellon University will establish and maintain within an electronic data file in the University Student Services Suite (S3, our student information system) a complete permanent record, whether the student is degree-seeking or non-degree seeking, whether enrolled for credit or not. The University Registrar's Office staff will, under the direction of the University Registrar, add to the electronic record such new information as pertains to the student's demographic and academic record as it becomes available, semester-by-semester, and as the student progresses in his/her career at Carnegie Mellon University.

Daily, the Carnegie Mellon University Computing Services Division will perform a backup of all databases that have been altered during that day. Weekly, the Computing Services Division will perform a complete backup of all records within the student data file. The Computing Services Division staff will store the daily backups in the climate-controlled, fire-proof, limited-access security facility in the Computer Operations center in Cyert Hall on the Carnegie Mellon University campus. Upon successful completion of the monthly backup, the Computing Services Division staff will securely transfer the weekly and monthly backups from the preceding month to climate-controlled, fire-proof, secured vault at an offsite facility.

#### Cessation of Operations

In the unlikely event that CMU (which has existed for more than 120 years) ceases to exist, it will make appropriate arrangements to comply with clauses (1) and (2) for all its students consistent with the Commonwealth of Pennsylvania statutes and law. There is an informal plan and agreement with the University of Pittsburgh's University Registrar's Office, that should either school cease, we would exchange student records.

### **20.16 TUITION AND FEES**

The tuition rate for students entering the MEIM program is set in the spring for the class entering in the following fall semester. Tuition and required university fees (generally the student activities fee, technology fee and transportation fee) are subject to change. Students are required to pay the then-current rates for program tuition and required university fees each semester. Tuition typically increases 3% to 5% each academic year. Other fees may apply. For example, requests by students for official university documents (e.g., requests for transcripts, enrollment verifications and academic records) may require payment of the relevant fee(s), and students electing to enroll and participate in tuition payment plans must pay the relevant fees to the payment plan processor. Information about the above required university fees and other fees can be found on Carnegie Mellon University's website, at <http://www.cmu.edu/sfs/>. In

In addition to the above, Health Insurance is also required. Students are required to show proof of appropriate insurance coverage or purchase student health insurance coverage through Carnegie Mellon University's third-party student health insurance program.

*Note: The following information is specific to the tuition, fees, and estimated books and supplies for the MEIM program for students in their second year in the program in Fall 2023 and Spring 2024. These figures do NOT include the "optional costs" or "indirect costs" associated with the cost of attending the MEIM program.*

Program Tuition (Year 2 in CA)	\$ 54,110
Required University Fees (Year 2 in CA)	\$ 698
Books and Supplies (estimated Year 2 in CA)	\$ 1,250
Estimated Fees/Charges for Entire Program (Year 2 in CA)	\$ 57,385

*Note: The following is applicable to MEIM students who are beginning the MEIM program in August 2023 (expected graduation in May 2025). It includes the tuition, fees, and estimated books and supplies for the duration of the MEIM program as well as the "optional costs" and "indirect costs" associated with the cost of attending the MEIM program.*

Estimated Cost of Attendance (Beginning in Fall 2023)	Pittsburgh		Los Angeles	
	Fall 2023	Spring 2024	Fall 2024	Spring 2025
<b>Charged to the Student Account</b>				
Estimated Full-time Tuition	\$27,055	\$27,055	\$27,870	\$27,870
Student Activities Fee	119	119	119	119
Transportation Fee	128	128	0	0
Technology Fee	230	230	230	230
Health Insurance (actual costs may vary)	2,577		2,577	
<b>Optional Costs</b>				
Room (actual costs may vary)	4,662	4,662	5,177	5,177
Board (actual costs may vary)	2,000	2,000	2,218	2,218
Laptop (actual costs may vary)	1,500			
<b>Indirect Costs</b>				
Books/Supplies (actual costs may vary)	625	625	625	625
Travel (actual costs may vary)	1,383	1,383	1,535	1,535
Miscellaneous (actual costs may vary)	4,525	4,525	5,023	5,023
<b>Total Estimated Cost of Attendance (per semester)</b>	<b>\$44,804</b>	<b>\$40,727</b>	<b>\$45,374</b>	<b>\$42,797</b>

## 20.17 SCHOLARSHIPS/AWARDS

The fees and charges do not consider any scholarships or similar awards that have been or may be awarded to the student. A student must refer to the student's official financial award or admission letter(s) from Carnegie Mellon University to determine whether the student has been awarded any scholarships or similar awards, and the terms and conditions of those scholarships and awards.

## 20.18 OTHER FUNDING AVAILABLE FROM THE MEIM PROGRAM

MEIM students are awarded a one-time **\$1,200 re-location stipend** to assist all students with their expenses related to moving from Pittsburgh to Los Angeles prior to their second year.

In order to offset a portion of the additional expenses incurred during the second year of the MEIM program, all MEIM students who receive a scholarship for the first two semesters in the program receive **an additional \$2,500/semester in scholarship** support in each of their final two semesters in the program.

## 20.19 FEDERAL AND STATE FINANCIAL AID PROGRAMS

Meeting the cost of a graduate education is a significant investment. Carnegie Mellon University is committed to making it financially possible for graduate students to enhance educational development and reach their career goals. There are many financial aid resources available to students pursuing graduate studies at Carnegie Mellon University. Carnegie Mellon University participates in a number of Federal and state financial aid programs. Information about these financial aid programs can be found on Carnegie Mellon University's website, at <http://www.cmu.edu/finaid/index.html>

### **Carnegie Mellon University Consumer Information**

Below is a summary of consumer information made available to all Carnegie Mellon University prospective and current students as required by the Higher Education Act of 1965, as amended. Required Disclosures have been categorized into five topics. Each disclosure gives a brief description of information that is required to be disclosed and explains how it can be obtained. This information may be changed from time to time as required.

If you need assistance or would like a paper copy, contact the Student Financial Aid Office, 5000 Forbes Avenue, Warner Hall, Pittsburgh, PA. If you wish to speak with a representative about the information contained here, please contact Associate Director Catherine Demchak at (412) 268-1353.

### **Information about the Institution:**

#### Accreditation Information

Carnegie Mellon University is accredited by the Middle States Commission on Higher Education (MSCHE), 3624 Market Street, 2nd Floor West, Philadelphia, PA 19104 ([www.msche.org](http://www.msche.org)). The Commission may be contacted by telephone at 267-284-5000 or via email at [info@msche.org](mailto:info@msche.org) or [espanolinfo@msche.org](mailto:espanolinfo@msche.org) (Spanish/Español). The university's current "Statement of Accreditation Status" can be found at, <https://www.msche.org/institution/>.

#### State Approvals

Carnegie Mellon University is licensed to operate in the states listed below. Individuals may contact the relevant agency for more information or information about how to file a complaint.  
California

Bureau for Private Postsecondary Education

P.O. Box 980818

West Sacramento, CA 95798-0818

Telephone: 888-370-7589

Email: [bppe@dca.ca.gov](mailto:bppe@dca.ca.gov)

Website: [www.bppe.ca.gov](http://www.bppe.ca.gov)

New York

New York State Education Department

Office of Higher Education

Room 977 Education Building Annex

Albany, NY 12234

Telephone: 518-486-3633

Email: [hedepcom@nysed.gov](mailto:hedepcom@nysed.gov)

Website: [www.highered.nysed.gov](http://www.highered.nysed.gov)

Pennsylvania

Pennsylvania Department of Education

Office of Postsecondary and Higher Education

333 Market Street, 12th Floor

Harrisburg, PA 17126-0333

Telephone: 717-783-8228

Email: [ra-collunivseminfo@pa.gov](mailto:ra-collunivseminfo@pa.gov)

Website: [www.education.state.pa.us](http://www.education.state.pa.us)

Washington, D.C.

Office of the State Superintendent of Education

Government of the District of Columbia

810 First Street NE 9th Floor

Washington, DC 20002

Telephone: 202-727-6436

Email: [osse@dc.gov](mailto:osse@dc.gov)

Website: [osse.dc.gov](http://osse.dc.gov)

Inquiries regarding the university's accreditation status or authorization to operate in any of the above states may be directed to: Associate Vice President / Director of Enrollment Services, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh PA 15213, telephone: 412-268-5399, email: [krieg@andrew.cmu.edu](mailto:krieg@andrew.cmu.edu).

#### Distance Education, State Authorization and Reciprocity Agreement (SARA)

The State Authorization Reciprocity Agreement (SARA) is an agreement among member states, districts, and territories in the United States, which establishes national standards for interstate offering of postsecondary distance education courses and programs. It is intended to standardize the process of offering online courses and programs by postsecondary institutions located in states other than the state in which the enrolled student(s) are residing. SARA is overseen by a national council (NC-SARA) and administered by four regional education compacts.



Carnegie Mellon University has been approved by the Commonwealth of Pennsylvania to participate in NC-SARA and was accepted as a SARA institution on May 2, 2017; additionally, Carnegie Mellon secured approval through NC-SARA on May 18, 2017. Carnegie Mellon University is listed as an approved, participating institution on the NC-SARA website (<http://www.nc-sara.org/>). At this time, 49 of the 50 United States are SARA members. California is not a member of SARA; however, Carnegie Mellon is able to offer online education to California residents.

Except where prohibited by applicable law, students who reside outside of the United States generally are not restricted from enrolling in our online programs. Some online programs do require in-person attendance at one of Carnegie Mellon's teaching locations (e.g., Carnegie Mellon's Pittsburgh, Pennsylvania campus) for short portions of the program. Students interested in enrolling in a specific online program are encouraged to contact the person designated by the online program for questions about the program's requirements or enrollment.

#### Copyright Infringement Policies

Carnegie Mellon University takes copyright violation seriously. Besides raising awareness about copyright law, it takes appropriate action in support of enforcement as required by policy and law. United States copyright law (<http://www.copyright.gov/>) "protects the original works of authorship fixed in any tangible medium of expression, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device".

The University's Fair Use Policy (<http://www.cmu.edu/policies/administrative-and-governance/fair-use.html>) states that all members of the University must comply with US copyright law and it explains the fair use standards for using and duplicating copyrighted material. In addition, the policy prohibits the duplication of software for multiple uses, meeting the Digital Millennium Copyright Act (DMCA) (<http://www.copyright.gov/legislation/dmca.pdf>) requirements. The DMCA criminalizes the development or use of software that enables users to access material that is copyright protected. Furthermore, the Computing Policy (<http://www.cmu.edu/policies/information-technology/computing.html>) prohibits the distribution of copyright protected material via the University network or computer systems, unless the copyright owner grants permission.

The Higher Education Opportunity Act of 2008 (Public Law 110-315) Section 488, requires institutions of higher education to annually inform students that "unauthorized distribution of copyrighted material, including unauthorized peer-to-peer file sharing, may subject the students to civil and criminal liabilities". Carnegie Mellon does this by publication of a news article on Computing Services' website or via mass mail communication each semester. The law goes on to require institutions "to provide a summary of penalties for violation of Federal copyright laws, including disciplinary actions that are taken against students who engage in unauthorized distribution of copyrighted materials using the institution's information system." Copyright protected materials can include, but are not necessarily limited to:

- Music
- Movies or other videos

- Literary works
- Software
- Digital images or libraries

#### Cost of Attending the University

Actual tuition and fee charges can be found on the Student Financial Services' website at <https://www.cmu.edu/sfs/tuition/index.html>.

For estimated books and supplies, room and board, and personal/miscellaneous expenses view the cost of attendance for,

Graduate program at <https://www.cmu.edu/sfs/tuition/graduate/index.html>.

#### Descriptions of Academic Programs

Information on the university's graduate academic programs and degree offerings is available from the various schools/colleges and admitting offices. Links to those programs can be found at

<https://www.cmu.edu/academics/index.html>.

#### Faculty

Information on the university's faculty and instructional personnel is **available from individual schools/colleges. This information can be found on the university's academics website at**

<https://www.cmu.edu/academics/index.html>.

#### Facilities & Services for Disabled Students

The Office of Disability Resources provides responsive and reasonable accommodations to students who self-identify as having a disability, including physical, sensory, cognitive and emotional disabilities. If you would like to learn more about the services and accommodations provided by the Office of Disability Resources, visit their website at

<https://www.cmu.edu/disability-resources/students/>. To discuss your accommodation needs, please email us at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu) or call us at 412-268-6121 to set up an appointment.

#### Student Privacy & FERPA

One of the most significant changes a parent or guardian experiences in sending a student to college is the difference in privacy standards for educational records. Carnegie Mellon values the student's right to privacy. The university adheres to a federal law called the Family Educational Rights and Privacy Act (also called FERPA or the Buckley Amendment) that sets privacy standards for student educational records and requires institutions to publish a compliance statement, including a statement of related institutional policies. For more detailed information, view the university's brochure at <https://www.cmu.edu/hub/privacy/ferpa-brochure.pdf>.

#### Return to Title IV Funds Policy and Procedural Statement

##### Policy Reason

The U. S. Department of Education requires that the university determine the amount of Federal Title IV aid earned by a student who withdrawals or fails to complete the period of enrollment. The university must determine the earned and unearned portions of Title IV aid as of the date the student ceased attendance based on the amount of time the student spent in attendance. Up through the 60% point in the period of enrollment, a pro rata schedule is used to determine the

amount of Title IV funds the student has earned at the time of withdrawal. After the 60% point in the period of enrollment, a student has earned 100% of the Title IV funds he or she was scheduled to receive. For a student who withdraws after the 60% point-in-time, there are no unearned funds. Federal regulations can be found at:

Federal Student Aid Handbook, Volume 5

Chapter 1 Withdrawals and the Return of Title IV Funds 34 CFR 668.22

### Policy and Procedural Statement

At Carnegie Mellon Title IV funds are awarded to a student under the assumption that the student will attend school for the entire period for which the assistance is awarded. When a student withdraws, the student may no longer be eligible for the full amount of Title IV funds that the student was originally scheduled to receive.

If a recipient of Title IV grant or loan funds withdraws from a school after beginning attendance, the amount of Title IV grant or loan assistance earned by the student must be determined. If the amount disbursed to the student is greater than the amount the student earned, the unearned funds must be returned. If the amount disbursed to the student is less than the amount the student earned, and for which the student is otherwise eligible, he or she is eligible to receive a Post-withdrawal disbursement of the earned aid that was not received.

Carnegie Mellon determines the Withdrawal Date and Date of Determination to complete the return calculation. A student's withdrawal date and date of determination varies depending on the type of withdrawal. When a student provides official notification to Carnegie Mellon through the Student Leave of Absence and Withdrawal Process, the withdrawal is defined as official withdrawal. When the student does not complete the Student Leave of Absence and Withdrawal Process and no official notification is provided by the student it is considered an unofficial withdrawal.

### Leave of Absence/Withdrawal Process

A student may leave Carnegie Mellon by either taking a leave of absence (leaving the university temporarily with the firm and stated intention of returning) or by withdrawing from the university (leaving the university with no intention of returning). Students choosing to take a leave of absence should first contact their academic advisor to discuss their plans while on leave and to work out any conditions that may be necessary for a smooth return to Carnegie Mellon. A student deciding to leave the university should take the following steps:

- Complete a Leave of Absence or Withdrawal Form.
- The form must include **all** necessary signatures or the process will not be completed.
- Return the completed form to the University Registrar's Office, 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213.

### Determination of Withdrawal Date

Official Withdrawals (Notification Provided by the Student)

Those withdrawals defined as official are processed in accordance with federal regulations. The Office of the Registrar provides information that identifies which students have processed a Student Leave of Absence and Withdrawal Form for each semester. This information includes the Date of Withdrawal, the Date of Determination, Withdrawal/Leave Status (LA, LS, & W2) and the

semester of attendance. This information is maintained in the student's academic file and in the university's Student Information System.

For students who notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is the earliest of:

- Date the student began the withdrawal or leave of absence process;
- Date the student notified his or her home department;
- Date the student notified the associate dean of his or her college; or
- Date the student notified the dean of students.

#### Unofficial Withdrawal (No Official Notification Provided by the Student)

For a student who withdraws without providing notification to Carnegie Mellon, the institution determines the withdrawal date using defined criteria. This category of withdrawals includes students that drop out and students that do not earn a passing grade.

To identify the unofficial withdrawals the Registrar develops a preliminary list of students that did not complete the semester by reviewing the final student grade reports. The list includes all students with: a) semester units carried, b) 0 semester units passed, c) 0 quality points earned, and d) 0.0 QPA. The Registrar contacts the academic divisions about each student to determine if the student actually completed the semester and earned the grades (0.0) or failed to complete the semester and did not notify the university of their status.

For students who do not notify the university of their intent to withdraw or take a leave of absence, the official date of withdrawal or leave of absence is:

- The midpoint of the semester;
- The last date the student attended an academically-related activity such as an exam, Tutorial or study group, or the last day a student turned in a class assignment.

#### Date of Determination that the Student Withdrew

Carnegie Mellon is not required to take attendance and the Date of Determination that a student withdrew varies depending upon the type of withdrawal: Official or Unofficial.

1. For withdrawals where the student **provided *Official Notification*** the Date of Determination is: The student's withdrawal date, or the date of notification, whichever is later.
2. For withdrawals where the student **did not provide *Official Notification*** the Date of Determination is: The date the institution becomes aware the student has ceased attendance.

For a student who withdraws without providing notification to the institution, the institution must determine the withdrawal date no later than 30 days after the end of the enrollment period.

#### Calculation of Earned Title IV Assistance

The withdrawal date is used to determine the point in time that the student is considered to have withdrawn so the percentage of the period of enrollment completed by the student can be determined. The percentage of Title IV aid earned is equal to the percentage of the period of enrollment completed.

The amount of Title IV federal aid earned by the student is determined on a pro-rata basis up to the end of 60% of the semester. If the student completed 30% of a term, 30% of the aid originally scheduled to be received would have been earned. Once a student has completed more than

60% of a term, all awarded aid (100%) has been earned. The percentage of federal aid earned and the order in which the unearned aid is returned are defined by federal regulatory requirements.

The calculation of earned Title IV funds includes the following grant and loan funds if they were disbursed or could have been disbursed to the student for the period of enrollment for which the Return calculation is being performed:

- Pell Grant
- Iraq and Afghanistan Service Grant
- TEACH Grant (not available at Carnegie Mellon)
- FSEOG Grant
- Federal Direct Loan

#### Institutional Charges

Institutional charges are used to determine the portion of unearned Title IV aid that the school is responsible for returning. Carnegie Mellon ensures that all charges for tuition, fees, room and board, as well as all other applicable institutional charges are included in the return calculation. Institutional charges do not affect the amount of Title IV aid that a student earns when he or she withdraws.

The institutional charges used in the calculation usually are the charges that were initially assessed the student for the period of enrollment. Initial charges are only adjusted by those changes the institution made prior to the student's withdrawal (for example, for a change in enrollment status unrelated to the withdrawal). If, after a student withdraws, the institution changes the amount of institutional charges it is assessing a student, or decides to eliminate all institutional charges, those changes affect neither the charges nor aid earned in the calculation.

#### Return of Unearned Funds to Title IV

If the total amount of Title IV grant and/or loan assistance that was earned as of the withdrawal date is less than the amount that was disbursed to the student, the difference between the two amounts will be returned to the Title IV program(s) and no further disbursements will be made.

If a student has received excess funds, the College must return a portion of the excess equal to the lesser of the student's institutional charges multiplied by the unearned percentage of funds, or the entire amount of the excess funds.

The funds will be returned in the order below as prescribed by federal regulations, within 45 days from the date of determination that a student withdrew.

- Unsubsidized Federal Stafford Loans
- Subsidized Federal Stafford Loans
- Federal PLUS loans
- Federal Pell Grants
- Federal Supplemental Educational Opportunity Grants (FSEOG)

### Post-Withdrawal Disbursements

If the total amounts of the Title IV grant and/or loan assistance earned as of the withdrawal date is more than the amount that was disbursed to the student, the difference between the two amounts will be treated as a post-withdrawal disbursement. In the event that there are outstanding charges on the student's account, Carnegie Mellon will credit the student's account for all or part of the amount of the post-withdrawal disbursement up to the amount of the allowable charges.

Any amount of a post-withdrawal disbursement that is not credited to a student's account will be offered to the student within 30 days of the date that the institution determined that the student withdrew. Upon receipt of a timely response from the student, the College will disburse the funds within 90 days of the date of determination of the student's withdrawal date.

### Return of Title IV Funds – Withdrawals for Programs Offered in Modules

The return of Title IV funds for programs offered in modules is defined in a separate policy statement at Carnegie Mellon. This document is included as an addendum to the Carnegie Mellon University Return to Title IV Funds Policy and Procedural Statement (see below).

### Policies and Procedures

Federal Student Aid Handbook, Volume 5, Chapter 2 Withdrawals and the Return of Title IV Funds

CFR 668.22 (a), (f) and (l)

Dear Colleague Letter GEN-11-14 July 2011

For all programs offered in modules, a student is a withdrawal for Title IV purposes if the student ceases attendance at any point prior to completing the payment period or period of enrollment (unless the institution has written confirmation from the student that they will attend a module that begins later in the enrollment period).

The regulations require the institution to determine whether Title IV funds must be returned based on the number of days actually completed versus the number of days the student was scheduled to attend in the payment period. The regulations prevent students from enrolling in modules or compressed courses spanning the period, completing a portion of the period, and retaining all aid for the period.

A program is considered to be offered in modules if a course or courses in the program do not span the entire length of the payment period or period of enrollment. The rule impacts all programs offering courses shorter than an entire semester, including semester-based programs with a summer term consisting of two consecutive summer sessions.

The Student Financial Aid Office has established the following procedures associated with handling withdrawals from programs offered in modules. An Associate Director of Student Financial Aid has the primary responsibility for compliance and implementation of these regulatory requirements.

1. The institution will identify students enrolled for the summer session that are eligible for Title IV Aid.

- Pell eligible students are identified
  - Students with summer loans are identified
  - The period of enrollment and enrollment status will be identified for each student
2. All Leave/ Withdrawal Forms processed by the University Registrar's Office will be reviewed for the summer sessions to record the Withdrawal Date and Date of Determination to identify any student receiving federal funding.
  3. The Student Financial Aid Office will identify any students that drop courses in the summer sessions.
    - During Summer I this is standard procedure
    - During Summer II this is reviewed after 10th day reporting
    - Any additional dropped courses will be reviewed through the 60% enrollment period
  4. Students who are identified as official withdrawals or that officially drop all courses in a session will be reviewed to determine the amount of federal financial aid earned. If a Return of Title IV aid is required, existing institutional procedures will be followed.
  5. At the end of the enrollment period the institution will determine if any students are identified as 'unofficial withdrawals.' If a Return of Title IV aid is required, existing institutional procedures will be followed.
  6. If a student does not begin courses in all sessions, a Return of Title IV aid may not be required, but other regulatory provisions concerning recalculation may apply.
    - If a student completes both courses in module one, but officially drops courses in module two while attending module one the student is not a withdrawal.
    - Since the enrollment is less than half time, the student is no longer eligible for the loan and the funds must be returned.

The following information obtained from the Federal Student Aid Handbook, Chapter 2, Withdrawals and the Return of Title IV Funds, will be used to determine whether a student enrolled in a series of modules is a withdrawal.

#### **How to determine whether a student in a program offered in modules has withdrawn**

Schools can determine whether a student enrolled in a series of modules is a withdrawal by asking the following questions.

1. ***After beginning attendance in the payment period or period of enrollment, did the student cease to attend or fail to begin attendance in a course he or she was scheduled to attend?***
  - If the answer is no, this is not a withdrawal.
  - If the answer is yes, go to question 2.
2. ***When the student ceased to attend or failed to begin attendance in a course he or she was scheduled to attend, was the student still attending any other courses?***
  - If the answer is yes, this is not a withdrawal; however other regulatory provisions concerning recalculation may apply.
  - If the answer is no, go to question 3.
3. ***Did the student confirm attendance in a course in a module beginning later in the period (for non-term and nonstandard term programs, this must be no later than 45 calendar days after the end of the module the student ceased attending)?***
  - If the answer is yes, this is not a withdrawal, unless the student does not return.

- If the answer is no, this is a withdrawal and the Return of Title IV Funds requirements apply.

### Contact

Questions regarding this policy or its intent should be directed to the Student Financial Aid Office at 412-268-1353.

### Satisfactory Academic Progress Policy and Procedural Statement

To be eligible for federal, state, and institutional financial aid, all students are required to maintain Satisfactory Academic Progress toward the completion of a degree. Each university determines its own policy in accordance with federal regulations set forth by the U. S. Department of Education regarding satisfactory progress standards to ensure student success. To maintain Satisfactory Academic Progress at Carnegie Mellon University, students must meet the following minimum standards for both of the qualitative (QPA) and quantitative (completion rate) measures:

Student Type	QPA (Qualitative)	Completion Rate (Quantitative)*
First Year Undergraduate	1.75	80%
Undergraduate Upper-class	2.00	80%
Heinz Graduate	3.00	80%
Other Graduate (excluding Tepper)	2.00	80%

*\*To calculate the completion rate, the cumulative number of completed units is divided by the cumulative number of units attempted. Advance Placement credits are excluded from both figures.*

In addition to the above-mentioned Financial Aid Satisfactory Academic Progress standards, federal regulations require a student to complete their degree within a specified amount of time. The maximum timeframe cannot exceed 150 percent of the time published as needed for completion of the program.

### Scope:

This policy applies to Federal aid including Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Work-Study, Federal Direct Loans, and Federal Direct PLUS Loan programs; state grant aid; and Carnegie Mellon institutional aid including grants, loans, and scholarships.

Federal regulations can be found at,  
 Federal Student Aid Handbook, Volume 1  
 Chapter 1 School Determined Requirements  
 34 CFR 668.16(e)  
 34 CFR 668.32(f)  
 34 CFR 668.34



### Evaluation:

Carnegie Mellon evaluates all students for Financial Aid Satisfactory Academic Progress annually, at the end of the spring semester. Students that are included in the review are undergraduates, graduates, both full-time and part-time.

Courses that do not count toward a student's degree cannot be used to determine enrollment status for financial aid purposes. Carnegie Mellon will count transfer credit hours that are accepted toward a student's educational program as both attempted hours and completed hours. Advanced Placement Non-Degree and Non-Credit courses are not counted as units passed or attempted. When a course is repeated, all grades will be recorded on the official academic transcript and will be calculated in the student's QPA. For financial aid eligibility, only one repeat per course is permitted in the determination of enrollment status for courses previously passed. If the student withdraws and is not assigned a W grade, then it will not be counted in the number of units attempted or completed. If the W grade is assigned, the units will be counted in the number of units attempted and will be counted as zero in the number of units completed. If the student has incomplete units, the units will be counted as attempted and will be counted as zero in the number of units completed.

The Financial Aid Satisfactory Academic Progress evaluation is a cumulative review of all semesters, regardless of whether or not the student received financial aid during the academic year.

If the minimum requirements are not achieved, the student is ineligible to receive financial aid. In such a case, the student is notified and given an option to appeal their financial aid status. More information about the appeal process can be found at <https://www.cmu.edu/student-affairs/theword/academic-discipline/appeals-academic-review-board-decisions.html>

A financial aid package will not be completed unless an appeal is received, approved and processed accordingly. If by chance a financial aid package is processed and released to the student, it is conditional and subjected to financial aid removal until an appeal is received, approved and processed accordingly.

### Contact:

Accountable Department: Enrollment Services, Student Financial Aid. Questions regarding this policy or its intent should be directed to the Student Financial Aid Office, phone: 412-268-1353.

### Student Body Diversity

For Information about the diversity of the university student body, contact the Institutional Research and Analysis Office, <https://www.cmu.edu/ira/index.html>.

For information about the University's Diversity, Equity and Inclusion initiative, visit the Center for Student Diversity and Inclusion's website at <https://www.cmu.edu/student-diversity/>.

### Written Arrangement Information

A U.S. Department of Education regulation requires disclosure of specific information to prospective and current students regarding written arrangements between Carnegie Mellon

University (CMU) and any institution(s) that provides a portion of an educational program to students enrolled at CMU. CMU enters into such arrangements to enrich the educational experiences offered to its students. In accordance with the regulation, CMU provides this information at <http://www.cmu.edu/hub/consumer-information/docs/written-arrangement.pdf>.

#### Student Complaints & Consumer Information by State

As required for compliance with U.S. Federal Program Integrity Regulations, state official/agency contact information for each U.S. state/territory that could handle a student's complaint is provided at <https://www.cmu.edu/hub/consumer-information/docs/complaints.pdf>.

#### Gainful Employment Disclosures

As required by U.S. Department of Education regulations Gainful Employment Disclosures (Disclosures about CMU certificate programs that prepare students for specific occupations) can be found at <https://www.cmu.edu/hub/consumer-information/>.

#### **Information about Student Financial Aid:**

Meeting the cost of higher education is a significant investment. We are committed to providing a comprehensive financial aid program that makes it possible for admitted students to attend Carnegie Mellon.

#### Application Process & Timeline:

Graduate Students: **To apply for financial aid for the 2024-2025 academic year, follow the steps below.**

##### 1. Free Application for Federal Student Aid (FAFSA)

The FAFSA is required if applying for federal financial aid programs. There are now two ways to complete the *Free Application for Federal Student Aid (FAFSA)* form: a redesigned <https://studentaid.ed.gov/sa/fafsa> website or a mobile app (available through Google Play, <https://play.google.com/store/apps/details?id=com.fsa.mystudentaid> or the Apple App Store: <https://apps.apple.com/us/app/mystudentaid/id1414539145>

We recommend using the IRS Data Retrieval Tool (DRT) (<https://studentaid.gov/resources/irs-drt-text>) to complete the FAFSA. The DRT transfer process has been improved to include stronger security and privacy protections; therefore, tax information transferred will not display on the form or Student Aid Report. Instead, the phrase "Transferred from the IRS" will appear in the fields.

Those selected for federal verification after FAFSA completion or those unable to use the IRS DRT will need to request an IRS Tax Return Transcript (<https://www.irs.gov/individuals/get-transcript>).

Additional information:

- Apply as soon as possible after October 1.
- Carnegie Mellon's federal code is 003242.
- Use 2022 tax information to complete the FAFSA.
- A Department of Education Federal Student Aid (FSA) ID is required. View FSA ID instructions at <https://fsaid.ed.gov/npas/index.htm>.
- Students must complete the FAFSA's electronic signature requirement.

## 2. MPN & Entrance Counseling

All first-time Federal Direct Loan borrowers are required to complete entrance counseling. The entrance counseling session provides information about borrower rights and responsibilities. CMU will be notified when a student has completed online entrance counseling. Funds will not be disbursed until the entrance counseling session has been completed. Students who completed a federal entrance counseling session while at CMU, do not have to complete another session.

Additional information:

- View entrance counseling instructions (<https://www.cmu.edu/sfs/financial-aid/types/federal-loans/direct/mpn-entrance-counseling.html>).
- Complete entrance counseling session at <https://studentloans.gov>.

## 3. Grad PLUS Loan

If you plan on borrowing a Federal Direct Graduate PLUS Loan, this is a two-part process and both parts must be completed in order for your loan to be originated. If you borrowed a Grad PLUS Loan last academic year, you are only required to complete the application portion of the process. The application portion of the process cannot be completed before June 1, 2024.

Additional information:

- View detailed Grad PLUS Loan instructions at <https://www.cmu.edu/sfs/financial-aid/types/federal-loans/plus/instructions.html>.
- The two-part process may be completed at <https://studentloans.gov>.

## Financial Aid Eligibility Notification

Once a student completes all of the steps above, a financial aid package will be determined. The Student Financial Aid Office will notify the student by email that a financial aid award letter has been posted to SIO (<https://s3.andrew.cmu.edu/sio/index.html#finances-home>). The letter contains information and further instructions regarding the student's eligibility and awards. If a student's circumstances change, then financial aid eligibility will be re-evaluated and the student will receive notification that a revised award letter is available in SIO.

## Missing Documents

If we are unable to process a student's financial aid package due to missing documents, a Financial Aid Alert email will be sent to the student requesting the required documents by a specified date. Until the entire application process is completed and all required documents are submitted, our office may be unable to complete a student's financial aid package. Students may log in to SIO (<https://s3.andrew.cmu.edu/sio/index.html#finances-home>) to view documents that

have been received by our office. [View instructions](https://www.cmu.edu/sfs/financial-aid/missing-documents/index.html) for submitting missing documents at <https://www.cmu.edu/sfs/financial-aid/missing-documents/index.html>.

### Teacher Certification

Teacher certification students at the graduate level should be aware that federal regulations classify them as a grade level 5 undergraduate student for Federal Direct Student Loan purposes. Teacher certification students are, however, considered a graduate student by Carnegie Mellon for academic purposes.

### Available Financial Aid

#### Scholarships & Grants

##### Graduate Students:

Graduate students interested in scholarships and grants may contact their program of interest or department. View more information on the Graduate Education Office website, <http://www.cmu.edu/graduate/prospective-students/index.html>. In addition, the Fellowships & Scholarships Office (<http://www.cmu.edu/fso/>) provides support to graduate students interesting in pursuing certain external scholarships, like Fulbright and UK Awards.

#### Federal Work-Study

Federal Work-Study (FWS) is a need-based self-help award. If a student has been awarded FWS, the FWS award is the total that can be earned during the academic year as a work-study student.

#### Federal Loans

For many students and families, educational loans are a necessary part of the process of paying for college. Student Financial Aid certifies loans for students, as well as Federal Direct Parent PLUS Loans for parents of undergraduates and Federal Direct Grad PLUS Loans for graduate students.

#### Federal Direct Student Loan

The Federal Direct Student Loan is the most widely-used loan for college students and is available to both undergraduate and graduate students. There are two types of Federal Direct Student Loans, subsidized and unsubsidized, and eligibility for both is determined by completing the FAFSA.

#### Grad PLUS Loan

Eligible graduate students may borrow a Federal Direct Grad PLUS Loan to assist with educational expenses. Students may borrow any amount up to their calculated cost of attendance minus any other aid received.

#### Private Loans

Private loan programs offer competitive interest rates and borrower benefits. To increase chances of approval and possibly improve the rate you receive, students are strongly recommended to apply with a creditworthy co-signer.

### Student Outcomes

#### Retention and Graduation Rates

Institutional Research and Analysis Office offers up-to-date data on degrees conferred, enrollment reports, freshmen retention rates and race and ethnicity reports for annual degrees. Retention and Graduation rates can be found at <https://www.cmu.edu/ira/retentiongradrates.html>.

#### Intercollegiate Athletic Program Participation Rates and Financial Support Data (Equity in Athletics Disclosure Act)

Please visit the U.S. Department of Education's site, The Equity in Athletics Data Analysis (<http://ope.ed.gov/athletics/#/>) and select the "Get data for one schools" option. Enter "Carnegie Mellon University" in the "Name" field and select the "Continue" button at the bottom of the page.

A printed copy of the report can be requested by calling the Department of Athletics, Physical Education, and Recreation at 412-268-8054 or by sending an email to Josh Centor, Associate Vice President for Student Affairs and Director of Athletics, Physical Education & Recreation, at [jcentor@andrew.cmu.edu](mailto:jcentor@andrew.cmu.edu).

### **Health and Safety**

#### Drug and Alcohol Abuse Prevention Program

Under the Drug Free Workplace Act of 1988 and the Drug Free Schools and Campuses Act of 1989, the Carnegie Mellon University is required to have an alcohol and other drug policy outlining prevention, education and intervention efforts and consequences for policy violations. The policy can be found at [https://www.cmu.edu/student-affairs/pdfs/2019-2020\\_alcohol\\_drug\\_guide.pdf](https://www.cmu.edu/student-affairs/pdfs/2019-2020_alcohol_drug_guide.pdf)

#### CMU Annual Security and Fire Safety Report

- A printed copy of the report can be requested by contacting University Police at 412-268-6232 or [campuspd@andrew.cmu.edu](mailto:campuspd@andrew.cmu.edu).
- The annual security and fire safety report (Carnegie Mellon University Police Department Annual Reports) is also available online at <http://www.cmu.edu/police/security-fire-reports/index.html>.

#### Vaccination Policies

- CMU Prematriculation Immunization Policy can be found at <http://www.cmu.edu/policies/student-and-student-life/immunizations.html>.
- CMU University Health Services Health Requirements for Incoming Students can be found at <https://www.cmu.edu/health-services/new-students/>.

## Other Information

### Voter Registration

Please visit <https://www.usa.gov/voter-registration>

### Carnegie Mellon Ethics Hotline

The health, safety and well-being of the university community are top priorities at Carnegie Mellon University. CMU provides a hotline that all members of the university community should use to confidentially report suspected unethical activity relating to financial matters, academic and student life, human relations, health and campus safety or research.

Students, faculty and staff can anonymously file a report by calling 877-700-7050 or visiting [www.reportit.net](http://www.reportit.net) (user name: tartans; password: plaid). All submissions will be reported to appropriate university personnel.

*The hotline is NOT an emergency service. For emergencies, call University Police at 412-268-2323.*

### Statement of Assurance

Carnegie Mellon University does not discriminate in admission, employment, or administration of its programs or activities on the basis of race, color, national origin, sex, handicap or disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Furthermore, Carnegie Mellon University does not discriminate and is required not to discriminate in violation of federal, state, or local laws or executive orders.

Inquiries concerning the application of and compliance with this statement should be directed to the vice president for campus affairs, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213, telephone 412-268-2056.

Obtain general information about Carnegie Mellon University by calling 412-268-2000.

## 20.20 RESPONSIBILITY TO REPAY EDUCATIONAL LOANS

If you obtain a loan to pay for the Master of Entertainment Industry Management program, you will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If you have received federal student financial aid funds, you are entitled to a refund of moneys not paid from federal student financial aid program funds.

## 20.21 STATEMENT OF NO PETITION IN BANKRUPTCY

Carnegie Mellon University does not have a pending petition in bankruptcy, is not operating as a debtor in possession, and has not filed a petition in bankruptcy within the preceding 5 years, nor has Carnegie Mellon had a petition in bankruptcy filed against it within the preceding 5 years that resulted in re-organization under Chapter 11 of the United States Bankruptcy Code.

## 20.22 TUITION RECOVERY FUND

The State of California established the Student Tuition Recovery Fund (STRF) to relieve or mitigate economic loss suffered by a student in an educational program at a qualifying institution, who is or was a California resident while enrolled, or was enrolled in a residency program, if the student enrolled in the institution, prepaid tuition, and suffered an economic loss. Unless relieved of the obligation to do so, you must pay the state-imposed assessment for the STRF, or it must be paid on your behalf, if you are a student in an educational program, who is a California resident, or are enrolled in a residency program, and prepay all or part of your tuition. The STRF Assessment Fee is refundable during the cancellation refund period.

You are not eligible for protection from the STRF and you are not required to pay the STRF assessment, if you are not a California resident, or are not enrolled in a residency program.

It is important that you keep copies of your enrollment agreement, financial aid documents, receipts, or any other information that documents the amount paid to the school. Questions regarding the STRF may be directed to the Bureau for Private Postsecondary Education, 2535 Capitol Oaks Drive, Suite 400, Sacramento, CA 95833, (916) 431-6959 or (888) 370-7589.

To be eligible for STRF, you must be a California resident or are enrolled in a residency program, prepaid tuition, paid or deemed to have paid the STRF assessment, and suffered an economic loss as a result of any of the following:

1. The institution, a location of the institution, or an educational program offered by the institution was closed or discontinued, and you did not choose to participate in a teach-out plan approved by the Bureau or did not complete a chosen teach-out plan approved by the Bureau.
2. You were enrolled at an institution or a location of the institution within the 120 day period before the closure of the institution or location of the institution, or were enrolled in an educational program within the 120 day period before the program was discontinued.
3. You were enrolled at an institution or a location of the institution more than 120 days before the closure of the institution or location of the institution, in an educational program offered by the institution as to which the Bureau determined there was a significant decline in the quality or value of the program more than 120 days before closure.
4. The institution has been ordered to pay a refund by the Bureau but has failed to do so.
5. The institution has failed to pay or reimburse loan proceeds under a federal student loan program as required by law, or has failed to pay or reimburse proceeds received by the institution in excess of tuition and other costs.
6. You have been awarded restitution, a refund, or other monetary award by an arbitrator or court, based on a violation of this chapter by an institution or representative of an institution, but have been unable to collect the award from the institution.

7. You sought legal counsel that resulted in the cancellation of one or more of your student loans and have an invoice for services rendered and evidence of the cancellation of the student loan or loans.

To qualify for STRF reimbursement, the application must be received within four (4) years from the date of the action or event that made the student eligible for recovery from STRF.

A student whose loan is revived by a loan holder or debt collector after a period of non-collection may, at any time, file a written application for recovery from STRF for the debt that would have otherwise been eligible for recovery. If it has been more than four (4) years since the action or event that made the student eligible, the student must have filed a written application for recovery within the original four (4) year period, unless the period has been extended by another act of law.

However, no claim can be paid to any student without a social security number or a taxpayer identification number.

### **20.23 STUDENT'S RIGHT TO CANCEL (WITHDRAWAL/LEAVES OF ABSENCE)**

A student has the right to cancel the student's Enrollment Agreement by either taking a leave of absence from the Program (leaving Carnegie Mellon University temporarily with the firm and stated intention of returning) or by withdrawing from the Program (leaving Carnegie Mellon University with no intention of returning). If the student withdraws or take a leave of absence from Carnegie Mellon University, the student may be eligible for a tuition adjustment or a refund of certain fees (excluding any Application Fee, Registration Fee and Enrollment Deposit, and any applicable Student Tuition Recovery Fund assessment).

To cancel the student's Enrollment Agreement and take a leave of absence or withdraw, the student must complete Carnegie Mellon University's Leave of Absence or Withdrawal form, as applicable, and return it to Carnegie Mellon University's Registrar's Office, at 5000 Forbes Ave., Warner Hall A12, Pittsburgh, PA 15213. The Leave of Absence and Withdrawal forms, and additional information of leaves of absence and withdrawal, can be found on Carnegie Mellon University's website, at <https://www.cmu.edu/policies/student-and-student-life/student-leave.html>

If the student notifies Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is the earliest of:

- The date the student began the student's withdrawal or leave of absence process at Carnegie Mellon University;
- The date the student notified the student's home department at Carnegie Mellon University;
- The date the student notified the associate dean of the student's College at Carnegie Mellon University; or
- The date the student notified the Carnegie Mellon University Dean of Student Affairs.

If the student does not notify Carnegie Mellon University of the student's intent to withdraw or take a leave of absence, the student's official date of withdrawal or leave of absence is:



- The midpoint of the relevant semester in which the student withdraws or takes a leave of absence;
- The last date the student attended an academically-related activity such as an exam, tutorial or study group, or the last day the student turned in a class assignment.

## 20.24 REFUND POLICY

A. **Refunds in General.** Students who withdraw from the Program or take a leave of absence after having paid the current semester's tuition and fees or receiving financial aid are subject to the following refund and repayment policies. No other charges are refundable. Student Tuition Recovery Fund assessment, if any, is non-refundable.

B. **Exit Counseling.** All borrowers of Federal student loans must complete a Federally-mandated exit counseling session when graduating or dropping to less than half-time enrollment status, including by withdrawing or taking a leave of absence. Exit counseling prepares students for repayment. Students must complete an exit counseling session in its entirety, with complete and correct information; otherwise, the student's degree, diploma and official transcripts may be withheld. Information about exit counseling sessions can be found on Carnegie Mellon University's website, at <https://www.cmu.edu/sfs/financial-aid/exit-counseling.html>

C. **Withdrawals/Leaves On or Before 10<sup>th</sup> Class Day.** Students who withdraw or take a leave of absence on or before the 10<sup>th</sup> class day of the relevant semester may receive a refund of 100% of tuition and fees (excluding any Application Fee or Registration Fee and Enrollment Deposit). STRF assessment, in any, is non-refundable.

D. **Withdrawals/Leaves after 10<sup>th</sup> Class Day.** Students who withdraw or take a leave of absence after the 10<sup>th</sup> class day of the relevant semester but before completing 60% of the semester will be assessed tuition based on the number of days completed within the semester. This includes calendar days, class and non-class days, from the first day of classes to the last day of final exams. Breaks which last five days or longer, including the preceding and subsequent weekends, are not counted. Thanksgiving and Spring Break are not counted. There is no tuition adjustment after 60% of the semester is completed. There is no refund of fees after the 10<sup>th</sup> class day of the relevant semester.

E. **Tuition Adjustment Appeals.** Students may appeal to have tuition adjustments for their leave of absence or withdrawal if they feel that they have extenuating circumstances. These appeals will be reviewed in the context of Carnegie Mellon University's tuition adjustment policy, as stated above. These appeals must be made in writing to Carnegie Mellon University's Registrar using Carnegie Mellon University's Tuition Appeal Adjustment form. Information about Carnegie Mellon University's tuition adjustment policy, and tuition adjustment appeals, can be found on Carnegie Mellon University's website, at [www.cmu.edu/sfs/tuition/adjustment/](http://www.cmu.edu/sfs/tuition/adjustment/)

F. **Repayment to Lenders/Third Parties.** If any portion of refundable tuition and/or fees was paid from the proceeds of a loan or third party, the refund may be sent to the lender, third party or, if appropriate, to the Federal or state agency that guaranteed or reinsured the loan, as required by law and/or Carnegie Mellon University policy. Any amount of the refund in excess of the unpaid balance of the loan shall be first used to repay any student financial aid programs from which the student received benefits, in proportion to the amount of the benefits received, and any remaining amount shall be paid to the student.

**G. Responsibility for Loan.** If the student obtains a loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund. If the student has received Federal student financial aid funds, the student is entitled to a refund of moneys not paid from Federal student financial aid program funds. If the student is eligible for a loan guaranteed by the Federal or state government and the student defaults on the loan, both of the following may occur: 1) The Federal or state government or a loan guarantee agency may take action against the student, including applying any income tax refund to which the person is entitled to reduce the balance owed on the loan. 2) The student may not be eligible for any other Federal student financial aid at another institution or other government assistance until the loan is repaid.

## 20.25 WARNING & PROBATION POLICIES

If you receive a warning, it is because the faculty is concerned about your progress at the College and your ability to successfully complete the program. You can expect to receive a warning if your cumulative GPA falls below 3.1 or if your semester GPA falls below 3.0.

If you are placed on probation, it is an indication that the faculty feels you are performing below the level needed to successfully complete the program. If you are on probation, it has implications for future academic action, and your eligibility for financial aid may be affected. The Program Committee considers recommending probation to the faculty if your cumulative GPA falls below 3.0.

If you are placed on probation, you must achieve at least a 3.0 GPA in the semester you are on probation; otherwise, the Program Committee will generally recommend to the faculty that you be suspended or dropped from the program. In addition, you must demonstrate the ability to raise your cumulative GPA to 3.0 within the normal timeframe of graduation. Again, if this seems impossible, the Program Committee will generally recommend to the faculty that you be suspended or dismissed from the program.

## 20.26 SUSPENSION OR DROP POLICIES

In general, you will be dropped from your program only if you have been on probation during the previous semester. However, under extraordinary circumstances as determined by the faculty, you may be suspended or dropped without previously having been placed on probation. The Program Committee will recommend that you be dropped if, at the end of the semester of probation, your semester GPA falls below 3.0, or if your cumulative GPA is such that it is unlikely that you will be able to complete the program in the normal period of time. The Program Committee may recommend that you be suspended from the program for up to one year if your performance in the program is unsatisfactory, even if you have not previously been placed on probation. Suspension is, in effect, a temporary drop. If you are suspended, you cannot register for or take classes at the College for a specified period of time, usually a year. The faculty views a suspension as a time to make up deficiencies, to develop a mature approach to the program, or to give more thought to future career goals. If you are suspended, you may enroll in your

Program again after the specified period and the faculty will indicate the conditions of your re-enrollment in your original suspension letter.

The decision of the faculty to suspend or drop a student is final. If you wish to appeal expulsion from the College, you can speak to the Dean; however, the Dean will only determine whether the Program Committee and the faculty followed due process and considered all relevant information over a sufficient time period.

### **20.27 LEAVE OF ABSENCE POLICY**

Occasionally, a student will have pressing personal circumstances that require him or her to take a leave of absence from the program. In such cases, the student should complete a Leave of Absence form to be approved by the Program Director and Associate Dean. Typically, a leave of absence is for an academic year.

### **20.28 FILING A GRIEVANCE**

The university's policies and procedures for filing a grievance are outlined at <http://www.cmu.edu/graduate/policies/appeal-grievance-procedures.html>

### **20.29 TRANSFERABILITY OF CREDITS AND CREDENTIALS EARNED**

The transferability of credits you earn at Carnegie Mellon University is at the complete discretion of an institution to which you may seek to transfer. Acceptance of the Master degree you earn in Entertainment Industry Management is also at the complete discretion of the institution to which you may seek to transfer. If the Master degree that you earn at this institution are not accepted at the institution to which you seek to transfer, you may be required to repeat some or all of your coursework at that institution. For this reason, you should make certain that your attendance at this institution will meet your educational goals. This may include contacting an institution to which you may seek to transfer after attending Carnegie Mellon University to determine if your Master of Entertainment Industry Management coursework will be accepted.

This includes but is not limited to conference and research funding; work study jobs in LA, lunch check-ins with administration and leadership including the college deans, and remote participation with student decision making when appropriate. In addition, two students are selected each year to be student representatives who assist in communication between MEIM leadership and the student body. Various networking and social events are planned at the MEIM-LA Center throughout the academic year. These events include Welcome Week LA, Industry Nights, networking events, and end of the semester events.

### **20.30 STUDENT SERVICES**

Though students reside in CA for the second year of the program, they still have access to student services that occur on the main campus. <https://www.cmu.edu/student-affairs/>

Annie Julian is the Heinz College Associate Director of Student Affairs. Her office is HBH A101G and her email is [ajulian@cmu.edu](mailto:ajulian@cmu.edu). Listed below are key offices of graduate student support.

### 20.31 OFFICE OF THE ASSISTANT VICE PROVOST FOR GRADUATE EDUCATION

The Office of the Assistant Vice Provost for Graduate Education, AVPGE, directed by Suzie Laurich-McIntyre, Ph.D., Assistant Vice Provost for Graduate Education, provides central support for graduate students in a number of roles. These include: being an ombudsperson and resource person for graduate students as an informal advisor; resolving formal and informal graduate student appeals; informing and assisting in forming policy and procedures relevant to graduate students; and working with departments on issues related to graduate students and implementation of programs in support of graduate student development.

The Office of the AVPGE often partners with the division of Student Affairs to assist graduate students with their Carnegie Mellon experience. Senior members of the student affairs staff are assigned to each college (college liaisons) and are often consulted by the Assistant Vice Provost for Graduate Education and departments on an individual basis to respond to graduate student needs.

The Office of the Assistant Vice Provost for Graduate Education (AVPGE) offers a robust schedule of professional development opportunities. Some are geared towards a specific population (master's students, PhD students at the beginning of their program, graduate students seeking tenure track positions, etc.) and others are open to all graduate students (time management, balancing, staying healthy). A full schedule of programs can be found at: [www.cmu.edu/graduate](http://www.cmu.edu/graduate)

The Office of the AVPGE also coordinates several funding programs, and academically focused seminars and workshops that advise, empower and help retain all graduate students, particularly graduate students of color and women in the science and technical fields. The fundamental goals of our programs have been constant: first, to support, advise and guide individual graduate students as they work to complete their degrees; second, to contribute to the greatest degree possible to the diversification of the academy. Visit the Graduate Education website for information about:

- Conference Funding Grants
- Graduate Small Project Help (GuSH) Research Funding
- Graduate Student Professional Development: seminars, workshops and resources
- Graduate Women Gatherings (GWG)
- Inter-university Graduate Students of Color Series (SOC)

### 20.32 OFFICE OF THE DEAN OF STUDENT AFFAIRS

[www.cmu.edu/student-affairs/index.html](http://www.cmu.edu/student-affairs/index.html)

The Office of the Dean provides central leadership of the meta curricular experience at Carnegie Mellon. The offices that fall under the division of Student Affairs led by Dean of Student Affairs Gina Casalegno, include:

### Career and Professional Development Center

- Counseling & Psychological Services (CAPS)
- Housing & Dining Services
- Orientation & First Year Programs (note: for undergraduate students)
- Office of International Education (OIE)
- Student Activities
- Student Life

Graduate students will find the enrollment information for Domestic Partner Registration and Maternity Accommodations in the Office of the Dean of Student Affairs and on the website. The Office of the Dean of Student Affairs also manages the Emergency Student Loan (ESLs) process. The Emergency Student Loan service is made available through the generous gifts of alumni and friends of the university. The Emergency Student Loan is an interest-free, emergency-based loan repayable within 30 days. Loans are available to enrolled students for academic supplies, medication, food or other expenses not able to be met due to unforeseeable circumstances. The Office of the Dean of Student Affairs also provides consultation, support, resources and follow-up on questions and issues of Academic Integrity: <https://www.cmu.edu/student-affairs/ocsi/>

### 20.33 CLINICAL SERVICES FOR OUT OF STATE STUDENTS OR STUDENTS LIVING INTERNATIONALLY

Counseling & Psychological Services (CaPS) is committed to work with any CMU student regardless of where they currently reside, whether that is guiding the student to find a provider in their area or helping them find the best possible solution given their individual situation. CaPS works on a case by case basis, considering the student's specific needs and current constraints. Due to licensure laws and limitations across different states, clinicians at CaPS can provide ongoing distance counseling only to students who are located within Pennsylvania. CaPS is aware that some states are beginning to change laws to allow out-of-state providers to provide teletherapy within their states. The leadership of the American Psychological Association (APA) and the American College Health Association (ACHA), as well as other relevant organizations, are advocating for reform across the country on this matter. CaPS is monitoring this situation closely to adapt services to these changes when they come.

If you reside outside of PA, CaPS provides Zoom video consultations with the purpose of assessing student's current needs, learning the student's location, identifying resources around the student, and providing guidance as the student secures these resources.

If the student resides internationally, CaPS may also provide Zoom video consultation with the purpose of assessing current needs and providing guidance about next steps.

Mailing List: CaPS also has an events mailing list that students can sign-up for:

<https://lists.andrew.cmu.edu/mailman/listinfo/caps-events>

Call to get started: 412-268-2922.

For information for students on Skills Workshops, Drop-in Groups and Clinics click [here](#).

For more Community Health & Well-Being and Student Affairs virtual events and opportunities, visit the [CMU Student Affairs calendar](#).

### 20.34 LOS ANGELES STUDENT SERVICES

The Los Angeles location does its best to stay connected with the main campus. Throughout the academic year there are video conferences with first-year students, the deans and senior administration on the main campus.

Aside from the student services support and resources on the main campus, students also have support at the LA campus. Students enrolled in the MEIM program who reside in the Los Angeles office in year two can meet with program director, Daniel T. Green, Ph.D. for on-site connection to various student services resources. These resources include questions regarding housing, transportation, health, personal concerns, entertainment industry organizations, clubs and student organizations, activities and general information. Dan Green's office is located in the MEIM-LA Center, 4840 Lankershim Blvd. Ste. 125, North Hollywood, CA 91602 and can be reached at 818-980-6346.

The MEIM-LA location hosts various networking and social events throughout the second year of the program. These events include a week-long orientation to Los Angeles and the entertainment industry called Welcome Week LA. MEIM leadership also plans Industry Nights where students travel to entertainment companies to meet and network with executives. Networking events, and end of the semester events are also planned throughout the year.

### 20.35 GRADUATE STUDENT ASSEMBLY

[www.cmu.edu/stugov/gsa/index.html](http://www.cmu.edu/stugov/gsa/index.html)

The Carnegie Mellon Student Government consists of an Executive Branch and a Legislative Branch. This is the core of traditional student government, as governed by the Student Body Constitution. The Executive Branch serves the entire student body, graduate and undergraduate, and consists of one president and four vice-presidents. The Legislative Branch for graduate students, The Graduate Student Assembly (GSA) passes legislation, allocates student activities funding, advocates for legislative action in locally and in Washington D.C. on behalf of graduate student issues and needs, and otherwise acts on behalf of all graduate student interests. GSA also contributes a significant amount of funding for conferences and research, available to graduate students through application processes. GSA also plans various social opportunities for graduate students and maintains a website of graduate student resources on and off-campus, <https://www.cmu.edu/stugov/gsa/Resources-for-Graduate-Students/index.html> Each department has representation on GSA and receives funding directly from GSA's use of the student activities fee for departmental activities for graduate students. The department rep(s) is the main avenue of graduate student representation of and information back to the graduate students in the department.

### 20.36 INTERCULTURAL COMMUNICATION CENTER (CCC)

[www.cmu.edu/icc/](http://www.cmu.edu/icc/)

The Intercultural Communication Center (ICC) is a support service offering both credit and non-credit classes, workshops, and individual appointments designed to equip nonnative English

speakers (international students as well as international students who attended high school in the U.S.) with the skills needed to succeed in academic programs at Carnegie Mellon. In addition to developing academic literacy skills such as speaking, reading and writing, students can learn more about the culture and customs of the U.S. classroom. The ICC also helps international teaching assistants (ITAs) who are non-native English speakers develop fluency and cultural understanding to teach successfully at Carnegie Mellon and provides ITA testing, required testing indicating a nonnative speaking student has a language proficiency required before being allowed to work with undergraduates in classes, labs or individual meetings.

### 20.37 OFFICE OF INTERNATIONAL EDUCATION (OIE)

[www.studentaffairs.cmu.edu/oie/](http://www.studentaffairs.cmu.edu/oie/)

Carnegie Mellon hosts international graduate and undergraduate students who come from more than 90 countries. Office of International Education (OIE) is the liaison to the University for all non-immigrant students and scholars.

OIE provides many services including: advising on personal, immigration, academic, social and acculturation issues; presenting programs of interest such as international career workshops, tax workshops, and cross-cultural and immigration workshops; supporting international and cultural student groups such as the International Student Union and the International Spouses and Partners Organization; maintaining a resource library that includes information on cultural adjustment, international education and statistics on international students in the United States; posting pertinent information to students through email and the OIE website, and conducting orientation programs.

### 20.38 SERVICES TO INTERNATIONAL STUDENTS

Carnegie Mellon University does admit students from other countries. The Carnegie Mellon Office of International Education (OIE) provides visa services for F-1 and J-1 international students as required by Department of Homeland Security regulations. These services, and related services such as advising and preparation of required documents, are provided to students at no additional charge.

### 20.38 JOB CLASSIFICATION

A MEIM degree can lead to a diverse set of occupations in the entertainment field. Itemized below, is a representative list of the employment positions determined to be within the field of study for a person obtaining a MEIM degree using the United States Department of Labor's Standard Occupational Classification codes (CEC 94910(f)(2)).

Program	CIP	SOC
MEIM	09.0909	10.0105 Communication Technology/Technician
		100202 Radio and TV Broadcasting Technology
	2000	50.0601 Film/Cinema Studies
		50.0102 Digital Arts
		50.0411 Game and Interactive Media Design

- 50.0601 Film/Cinema Studies
- 50.0602 Cinematography and Film/Video Production
- 50.0607 Documentary Production
- 50.0699 Film/Video and Photographic Arts
- 50.1001 Arts, Entertainment and Media Management, General
- 50.1099 Arts, Entertainment and Media Management, Other
- 50.1003 Music Management and Merchandising
- 50.0504 Playwriting and Screenwriting

<u>Employer Type</u>	<u>Function</u>
Agency	Acquisitions
Animation	Advertising
Digital	Business/Strategic Development
Film	Development
Finance	Distribution and/or Licensing
Gaming (Video)	Event Management
Music	Exhibition
Sports	Finance/Operations
Streaming	Legal/Business Affairs
Technology	Licensing
Television	Live Events (Concert/Tour/Festival)
Web3	Marketing
	PR
	Producing
	Production Management
	Programming/Scheduling (B'cast/Cable/OTT)
	Research/Analysis
	Talent Representation/Management
	Technology Management (IT/CG/Cloud/Platform)
	Writing
	Virtual Reality/Augmented Reality

**20.39 OFFICE OF STUDENT ASSISTANCE AND RELIEF**

The Office of Student Assistance and Relief is available to support prospective students, current students, or past students of private postsecondary educational institutions in making informed decisions, understanding their rights, and navigating available services and relief options. The office may be reached by calling (888) 370-7589, option #5, or by visiting [osar.bppe.gov](http://osar.bppe.gov)