

INI Pittsburgh - Silicon Valley School Catalog

Academic Year 2019-2020 (August 26, 2019 to May 1, 2020) as defined by the Official Academic Calendar at: <https://www.cmu.edu/hub/calendar/docs/1920-academic-calendar.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 2535 Capitol Oaks Drive, Suite 400, Sacramento, CA 95833, 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

Carnegie Mellon University – Information Networking Institute

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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/

Class Location

Classes offered for the INI Pittsburgh - Silicon Valley MSIT - IS/MOB programs 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/

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/msit/bppeact.html>.

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 mobility 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 Internet of Things 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 close to 300 students each year from across the world. Our students are provided with a distinctly interdisciplinary

learning experience: an advanced, specialized curriculum in information networking and computer systems, complemented by coursework in business, management, and policy.

The INI Mission

- Educate and develop engineers through technical, interdisciplinary master's degree programs in information networking, mobility, and security that incorporate business and policy perspectives. Our graduates contribute to technological advancements, pioneer engineering solutions, and lead enterprises in the global economy.
- Provide a teaching and learning environment that is welcoming, supportive, and inspiring for our students, faculty, staff, and alumni, regardless of their location in the world.
- Nurture a community of alumni, dedicated to the highest standards of ethics, who provide mentorship and encourage the proliferation of diverse opportunities for the global INI community.
- Pioneer collaborative and innovative educational initiatives that embody the entrepreneurial spirit of Carnegie Mellon University.

The INI Vision

- We will be the internationally recognized leader of technical, interdisciplinary graduate education in information networking, information security, and mobility.
- We will attract the top-performing, most technical, curious and hardworking individuals to our programs and prepare them for leadership in their field and the larger societal context.
- We will attract, retain, nurture, and promote a diverse student population.
- Our graduates will be the most sought after by industry, academia and government in their respective fields.
- We will connect, engage, strengthen and serve our global community of alumni.

The INI Values

Excellence: We strive for the utmost quality in everything we do.

Integrity: We require the highest moral and ethical standards in our research, education, and practice.

Diversity: We cultivate an inclusive culture that celebrates and values a diversity of opinion and intellectual perspective from all individuals, regardless of ethnic origin, race, religion, gender, age, disability, sexual orientation, and self-identity.

Interdisciplinarity: We advance the future of information networking, mobility, and security through interdisciplinarity and believe that different intellectual perspectives spur innovation and problem solving.

Innovation: We demonstrate agility and create novel solutions in response to the demands of the global market.

Engagement: We encourage involvement in campus life, industry, government and professional organizations, and public outreach activities in order to provide important links to the broader community.

The CMU 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.

Programs Offered

The INI offers two degrees through bicoastal delivery in collaboration with the Silicon Valley campus: Mobility (MSIT-MOB) and Information Security (MSIT-IS). 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.

MSIT- MOB

Prepares students to be at the forefront of the mobility 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:

- Explain historical and state-of-the-art mobile technologies relating to devices, networks, providers, data, and applications

- Apply mobile system skills toward design and implementation of mobile products and services
- Explain microeconomic and management principles important to businesses that run information systems
- A demonstrated ability to work on practical team projects with industry

MSIT- IS

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 gain the ability to:

- Explain security and privacy principles, and state-of-the-art techniques for security and privacy in information systems including devices, networks, software, and services
- Explain microeconomic and management principles important to businesses that run information systems
- Design and implement secure systems and services using knowledge and skills in information security and privacy
- A demonstrated ability to work on practical team projects with industry

Detailed outline of the requirements for completion of the INI Pittsburgh - Silicon Valley MSIT - IS/MOB programs, including required courses, any required internships, and the total number of units required for completion is provided below.

MSIT-IS/MOB MS30 Curriculum and Requirements (Students Starting in Fall 2018)

The curriculum consists of the following main components: the shared core courses, degree-specific core courses, restricted electives and a master's practicum.

The core courses establish the necessary background, a common competence level and a specialization in information security or mobility. The elective units give students flexibility and breadth in their coursework.

Finally, the capstone experience is the practicum, which requires students to apply their knowledge and skills to solve a real-world problem.

Shared Core Courses	36 units
Degree-Specific Core Courses (Mobility, Information Security, or Software Management)	48 units

Restricted Electives	36 units
Master's Practicum	24 units
Internship	0 units
Total	144 units

All INI students are required to complete a summer internship as part of their degree program.

Shared Core Courses (36 Units)

Of the 36 units of core courses, 12 units are management courses.

12 UNITS: CHOOSE FROM ONE COURSE BELOW

14-740: Fundamentals of Telecommunications & Computer Networks (FALL or SPRING)

15-641: Computer Networks (FALL)

18-756: Packet Switching and Computer Networks (FALL)

14-760: Advanced Real-Time Data Networks (SPRING)

12 UNITS: CHOOSE FROM ONE COURSE BELOW

14-741: Introduction to Information Security (FALL, First Year)

12 UNITS

14-776: Fundamentals of Business and Management (FIRST FALL or FIRST SPRING)

Degree-Specific Core Courses (48 Units)

Degree-specific courses allow students to create a custom core curriculum for their degree in Information Security or Mobility. Please refer to the Course List below. While we created a list of possible courses, it is not exhaustive and students are allowed to select other degree-specific courses as long as they are relevant to their track. If a student wants to pursue a degree-specific core course that is not included on the approved list, they should file a petition requesting permission to do so.

Course List

This list provides MSIT degree specific core 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. 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.

Note: 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.

Information Security Courses (Last updated: August 23, 2018)

Spring

05-836 Usable Security and Privacy (12 units)
14-735 Secure Coding (12 units)
14-761 Applied Information Assurance (12 units)
14-782 Information Security Risk Management I (6 units)
14-784 Information Security Risk Management II (6 units)
14-788 Information Security Policy and Management (6 units)
14-814 Wireless Network Security (SV, 12 units) (cross-listed 18-637)
14-819 Introduction to Software Reverse Engineering (12 units)
14-822 Host-Based Forensics (12 units)
14-828 Browser Security (12 units)- as of 1/25/17
14-850 InSURE Cybersecurity Research(12 units) (added 9/14/16)
15-811 Verifying Complex Systems (added 8/7/17)
18-632 Introduction to Hardware Security (added 8/7/17)
18-731 Network Security (12 units)
18-732 Secure Software Systems (12 units)
18-733 Applied Cryptography (12 units)
95-883 Ethical Penetration Testing (6 units) (added 8/23/18)

Fall

14-761 Applied Information Assurance (12 units)
14-809 Introduction to Cyber Intelligence (12 units) (added 4/28/15)
14-823 Network Forensics (12 units)
14-829 Mobile and IoT Security (SV, 12 units) (cross-listed 18-638)
14-850 InSURE Cybersecurity Research (12 units) (added 9/14/16)
18-734 Foundations of Privacy (12 units) (cross-listed 08-604)
19-608 Privacy, Policy, Law and Technology (12 units) (cross-listed 08-733, 08-533 & 95-818)
94-806 Privacy in the Digital Age (6 units)
95-883 Ethical Penetration Testing (6 units) (added 8/23/18)

Mobility Courses (Last updated: August 23, 2018)

Spring

05-833 Gadgets, Sensors & Activity Recognition in HCI (12 units)
05-670 Digital Service Innovation (12 units) (added 8/23/18)
05-872 Rapid Prototyping of Computer Systems (12 units, cross-listed 05-540, 18-745, 18-540, 39-648)
08-735 Building User-focused Sensing Systems (added 8/7/17)
08-766 Mobile & IoT Computing Services (6 units)(cross-listed 08-781, 45-887)
08-769 Mobile & IoT Computing Services Project (3 units)*
08-781 Mobile & IoT Computing Services (9 units)(cross-listed 08-766, 45-887)
14-642 Fundamentals of Embedded Systems (12 units)(cross-listed 18-349) (added 9/14/16)
14-736 Distributed Systems: Techniques, Infrastructure and Services (12 units) (added 8/23/18)
14-841 Mobile & Pervasive Computing (12 units) (cross-listed 18-843, 15-821)
15-619 Cloud Computing (12 units)
17-637 Web Application Development (12 units)
15-640 Distributed Systems
15-719 Advanced Cloud Computing (added 8/7/2017)
17-619 Introduction to Real-Time Software and Systems (12 units)
17-681 Java for Application Programmer (6 units)
18-549 Embedded Systems Design (12 units)
18-647 Connected Embedded Systems Architecture (added 8/7/17)
18-748 Wireless Sensor Networks (12 units)
18-759 Wireless Networks (12 units)(cross-listed 04-644)
18-842 Distributed Systems (12 units)
18-845 Internet Services (12 units)
49-780 Human Computer Interaction and User Experience (12 units) (added 8/23/18)
49-788 Mobile Apps for the Internet of Things (12 units)- as of 1/25/17

Summer

08-723 Mobile Application Development for iOS and Android (6 units)

Fall

05-863 Introduction to Human-Computer Interaction for Technology Executives (6 units) (added 1/22/15) (cross-listed 08-763, 45-888)
08-736 Pervasive and Ubiquitous Computing (12 units) (added 8/23/18)
14-642 Fundamentals of Embedded Systems (12 units)(cross-listed 18-349) (added 9/14/16)
14-829 Mobile and IoT Security (SV, 12 units)(cross-listed 18-638)
14-837 Java Smart Phone Development (12 units, cross-listed 18-641) (course number updated 4/28/15)
14-840 Mobile Hardware for Software Engineers (SV, 12 units) (cross-listed 18-644)
14-848 Cloud Infrastructure: Design, Analysis and Implementation (12 units) (added 8/23/18)
15-619 Cloud Computing (12 units)
14-841 Mobile & Pervasive Computing (12 units) (cross-listed 18-843, 15-821)

15-640 Distributed Systems
16-623 Designing Computer Vision Apps (12 units)
17-637 Web Application Development (12 units)
17-681 Java for Application Programmer (6 units)
18-697 Statistical Learning and Discovery (12 units) (added 9/14/16)
18-747 Wireless Device Architecture (added 8/30/17)
18-749 Building Reliable Systems (12 units) (added 9/14/16)
49-780 Human Computer Interaction and User Experience (12 units) (added 8/23/18)

*These two 3-unit courses are taken in conjunction with 08-781: Mobile & Pervasive Computing Services (9 units)

Restricted Electives (36 Units)

Students have the opportunity to pursue a wide range of electives in which they have a special interest. Restricted electives may not be taken as pass/no pass/audit.

36 UNITS

Students can select any approved courses in Heinz College and the Tepper School of Business and/or any courses* in ECE, EPP, ETC, the School of Computer Science, INI, or III (49-XXX) that are numbered 300 and above.

*Some exceptions apply.

Master's Practicum Course (24 Units)

14-798: INI Practicum Project (FALL)

Internship (0 Units)

All students must complete an INI-approved internship.

Residency Requirement (0 Units)

All students must fulfill a residency requirement for at least one semester at CMU Silicon Valley in a student's second Fall semester.

The MS30 Curriculum is also available on the INI website at:

https://www.cmu.edu/ini/academics/msit/curriculum_ms30.html

A printable version of the Pittsburgh-Silicon Valley MSIT Curriculum is available at:

https://www.cmu.edu/ini/academics/academics_docs/MSITCurriculumSheet_MS30_2018.pdf

MSIT-IS/MOB MS31 Curriculum and Requirements (Students Starting in Fall 2019)

The curriculum consists of the following main components: the shared core courses, degree-specific core courses, restricted electives and a master's practicum.

The core courses establish the necessary background, a common competence level and a specialization in information security or mobility. The elective units give students flexibility and breadth in their coursework.

Finally, the capstone experience is the practicum, which requires students to apply their knowledge and skills to solve a real-world problem.

Shared Core Courses	36 units
Degree-Specific Core Courses (Mobility, Information Security, or Software Management)	48 units
Restricted Electives	36 units
Master's Practicum	24 units
Internship	0 units
Total	144 units

All INI students are required to complete a summer internship as part of their degree program.
Shared Core Courses (36 Units)

Of the 36 units of core courses, 12 units are management courses.

12 UNITS: CHOOSE FROM ONE COURSE BELOW

14-740: Fundamentals of Telecommunications & Computer Networks (FALL or SPRING)

15-641: Computer Networks (FALL)

18-756: Packet Switching and Computer Networks (FALL)

14-760: Advanced Real-Time Data Networks (SPRING)

12 UNITS: CHOOSE FROM ONE COURSE BELOW

14-741: Introduction to Information Security (FALL, First Year)

12 UNITS

14-776: Fundamentals of Business and Management (FIRST FALL or FIRST SPRING)

Degree-Specific Core Courses (48 Units)

Degree-specific courses allow students to create a custom core curriculum for their degree in Information Security or Mobility. Please refer to the Course List below. While we created a list of possible courses, it is not exhaustive and students are allowed to select other degree-specific courses as long as they are relevant to their track. If a student wants to pursue a degree-specific core course that is not included on the approved list, they should file a petition requesting permission to do so.

Course List

This list provides MSIT degree specific core 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.

Note: 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.

Information Security Courses (Last updated: May 6, 2019)

Spring

- 05-836 Usable Security and Privacy (PIT, 12 units)
- 14-735 Secure Coding (PIT & Broadcast to SV, 12 units)
- 14-761 Applied Information Assurance (PIT, 12 units)
- 14-782 Information Security Risk Management I (PIT, 6 units)
- 14-784 Information Security Risk Management II (PIT, 6 units)
- 14-788 Information Security Policy and Management (PIT, 6 units)
- 14-814 Wireless Network Security (SV & Broadcast to PIT, 12 units) (cross-listed 18-637)
- 14-819 Introduction to Software Reverse Engineering (PIT & Broadcast to SV, 12 units)
- 14-822 Host-Based Forensics (PIT & Broadcast to SV, 12 units)
- 14-828 Browser Security (PIT & Broadcast to SV, 12 units)
- 14-850 INSuRE Cybersecurity Research (SV & Broadcast to PIT, 12 units)
- 15-811 Verifying Complex Systems (PIT, 12 units)
- 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)
19-733 Cryptocurrencies, Blockchains and Applications (PIT, 12 units) (cross-listed 17-703)
94-806 Privacy in the Digital Age (PIT, 6 units)
95-883 Ethical Penetration Testing (PIT, 6 units)

Summer

95-883 Ethical Penetration Testing (PIT, 6 units)

Fall

14-761 Applied Information Assurance (PIT, 12 units) 14-809 Introduction to Cyber Intelligence (PIT, 12 units) 14-823 Network Forensics (PIT, 12 units)
14-829 Mobile and IoT Security (SV & Broadcast to PIT, 12 units) (cross-listed 18-638)
14-850 INSuRE Cybersecurity Research (SV & Broadcast to PIT, 12 units)
18-734 Foundations of Privacy (PIT & Broadcast to SV, 12 units) (cross-listed 17-731)
18-737 Special Topics in Computer Systems (SV, 12 units) (Fall 2019 only)
19-608 Privacy, Policy, Law and Technology (PIT, 12 units) (cross-listed 17-733 & 95-818)
94-806 Privacy in the Digital Age (PIT, 6 units)
95-883 Ethical Penetration Testing (PIT, 6 units)

Mobility Courses (Last updated: May 6, 2019)

Spring

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 05-540, 18-745, 18-540, 39-648)
08-735 Building User-focused Sensing Systems (PIT, 12 units)
14-642 Fundamentals of Embedded Systems (PIT, 12 units)
14-736 Distributed Systems: Techniques, Infrastructure and Services (PIT & Broadcast to SV, 12 units)
14-760 Advanced Real-World Data Networks (PIT & Broadcast to SV, 12 units)
14-841 Mobile & Pervasive Computing (SV, 12 units) (cross-listed 18-843)
15-619 Cloud Computing (PIT & Broadcast to SV, 12 units)
17-637 Web Application Development (PIT, 12 units)
15-640 Distributed Systems (PIT, 12 units)
15-719 Advanced Cloud Computing (PIT, 12 units) (cross-listed 18-709)

17-681 Java for Application Programmer (PIT, 6 units)
17-781 Mobile and IoT Computing Services (PIT, 12 units)
18-651 Networked Cyber-Physical Systems (PIT, 12 units)
18-744 Connected Embedded Systems Architecture (SV, 12 units)
18-748 Wireless Sensor Networks (PIT, 12 units)
18-759 Wireless Networks (PIT, 12 units)
18-845 Internet Services (PIT, 12 units)
49-780 Human Computer Interaction and User Experience (SV, 12 units)
49-788 Mobile Apps for the Internet of Things (SV, 12 units)

Summer

08-723 Mobile Application Development for iOS and Android (PIT, 6 units)
49-788 Mobile Apps for the Internet of Things (SV, 12 units)

Fall

05-670 Digital Service Innovation (PIT, 12 units)
05-863 Introduction to Human-Computer Interaction for Technology Executives (PIT, 6 units) (cross-listed 45-888)
05-833 Gadgets, Sensors & Activity Recognition in HCI (PIT, 12 units)
08-736 Pervasive and Ubiquitous Computing (PIT, 12 units)
14-642 Fundamentals of Embedded Systems (PIT, 12 units)
14-829 Mobile and IoT Security (SV & Broadcast to PIT, 12 units) (cross-listed 18-638)
14-840 Mobile Hardware for Software Engineers (SV, 12 units) (cross-listed 18-644)
14-848 Cloud Infrastructure: Design, Analysis and Implementation (PIT & Broadcast to SV, 12 units)
15-619 Cloud Computing (PIT & Broadcast to SV, 12 units)
14-841 Mobile & Pervasive Computing (SV, 12 units) (cross-listed 18-843)
15-624 Logical Foundations of Cyber-Physical Systems (PIT, 12 units)
15-640 Distributed Systems (PIT, 12 units)
16-722 Sensing and Sensors (PIT, 12 units)
17-637 Web Application Development (PIT, 12 units)
17-681 Java for Application Programmer (PIT, 6 units)
17-728 Machine Learning and Sensing (PIT, 12 units)
18-661 Introduction to Machine Learning for Engineers (SV & PIT, 12 units) (Fall 2019 only)
18-740 Modern Computer Architecture and Design (SV & PIT, 12 units)
18-747 Wireless Device Architecture (SV, 12 units)
18-749 Building Reliable Systems (PIT, 12 units)
18-847 Special Topics in Computer Systems (PIT & SV, 12 units) (Fall 2019 only)
49-780 Human Computer Interaction and User Experience (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.

Restricted Electives (36 Units)

Students have the opportunity to pursue a wide range of electives in which they have a special interest. Restricted electives may not be taken as pass/no pass/audit.

36 UNITS

Students can select any approved courses in Heinz College and the Tepper School of Business and/or any courses* in ECE, EPP, ETC, the School of Computer Science, INI, or III (49-XXX) that are numbered 300 and above.

*Some exceptions apply.

Master's Practicum Course (24 Units)

14-798: INI Practicum Project (FALL)

Internship (0 Units)

All students must complete an INI-approved internship.

Residency Requirement (0 Units)

All students must fulfill a residency requirement for at least one semester at CMU Silicon Valley in a student's second Fall semester.

The MS31 Curriculum is also available on the INI website at:

https://www.cmu.edu/ini/academics/msit/curriculum_ms31.html

A printable version of the Pittsburgh-Silicon Valley MSIT Curriculum is available at:

https://www.cmu.edu/ini/academics/academics_docs/MSITCurriculumSheet_MS30_2018.pdf

INI Courses

14-513: Introduction to Computer Systems (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, memory organization and management, networking technology and protocols, and supporting concurrent computation. NOTE: students must achieve a C or better in order to use this course to satisfy the pre-requisite for any subsequent Computer Science course.

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: 18-240 and 15-513 and 18-213

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

14-728: 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. Proficiency in C and C++ are required. Prerequisites: None.

PREREQUISITES: None

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: 18-600 or 15-513

14-740: Fundamentals of Telecommunications & Computer Networks (12 units)

14-740 is a graduate-level, first-course in computer and telecommunication networks. There is no pre-requisite of an undergraduate equivalent, but basic computer, programming and probability theory background is required. The primary objective of this course is for you to learn the fundamental principles underlying computer and telecommunication networks. Using a top-down approach, we will cover topics in the application, transport, network and link layers of the protocol stack. We will also go over advanced topics, including network management, traffic engineering, and router internals. Besides learning about the nuts and bolts, you will gain an understanding as well in engineering tradeoffs made and design principles used in computer and telecommunication networks. Another objective is for you to apply some of this knowledge in the context of systems projects. We will follow an aggressive pace in this course. Prerequisites: Graduate standing.

PREREQUISITES: None

14-741: Introduction to Information Security (12 units)

The growing importance of information systems, and their use to support safety-critical applications, has made information security a central issue for modern systems. 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. Topics covered in the course include elementary cryptography; access control;

common software vulnerabilities; common network vulnerabilities; digital rights management; policy and export control law; privacy; management and assurance; 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.

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

14-774: Managerial economics (6 units)

This class presents the basic concepts of microeconomics theory with an emphasis on business applications. The approach of microeconomics is to solve an economic problem by modeling it as an optimization problem; the solution to the optimization problems then interpreted in terms of the original economic problem. This approach will be used to answer such problems as input selection, pricing and project selection. The format of the class is to present theory common to a general class of applied problems and then to apply the theory by solving actual problems. The goal of the class is for the students to be capable of applying the basic concepts to problems faced both future classes (e.g. finance, macroeconomics) and future careers. Prerequisites: Graduate standing.

PREREQUISITES: None

14-775: Business Management (6 units)

This class includes management functions such as accounting (reading and understanding financial statements, basic cost analysis and budgeting), finance (project evaluation and capital budgeting), human relations (motivation and organization of work), marketing (distribution and consumer behavior) and operations (production planning and control). The importance of information systems is emphasized across all management functions.

PREREQUISITES: None

14-776: Fundamentals of Business and Management (12 units)

This class will combine both economic and business topics. The class will contain applied microeconomics topics focused on resource allocation and efficiency in different market structures. We will explore perfect competition, monopoly and monopolistic competition and oligopolistic market structures. We will also explore macro-economic ideas so as to understand the context within which businesses operate. It is anticipated that these topics will occupy 1/3 of the class. The other 2/3 of the class will focus on business management from an applied, integrated view. The majority of the business topics will involve team-based work. We will cover 7 basic areas of management: Financial and Managerial Accounting Corporate Finance Marketing Operations Management Corporate Strategy Organizations Business Communications

PREREQUISITES: None

14-782: Information Security Risk Management I (6 units)

This course and its follow-on Information Security Risk Management II (14-784) examine information security as a risk management problem where the organization identifies information security risks, evaluates those risks, and makes risk mitigation and acceptance decisions given its resource constraints. In part one of this class students will learn foundational concepts in risk management and economic valuation and will be introduced standard risk management approaches for identifying, analyzing, and responding to risk, as well as the analytical tools for calculating the costs and benefits of investment security decisions. Learning Objectives: * Understand and use security risk management terminology * Understand and apply tools for evaluating decisions under uncertainty * Develop critical thinking and evaluation * Demonstrate basic proficiency in qualitative and quantitative risk analysis methods (OCTAVE, FAIR) * Understand and explain risk responses, including risk transfer and insurance

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

14-809: Introduction to Cyber Intelligence

Cyber intelligence; a phrase often used, but interpreted by government agencies, private companies, and the general public in many different ways. For the purpose of this course, cyber intelligence is the acquisition and analysis of information to identify, track, and predict cyber capabilities, intentions, and activities to offer courses of action that enhance decision making. Students will explore a different aspect of the definition each week to develop an analytic framework capable of discerning the interdependencies of and external influences on cyber intelligence, as it relates to an organization's environment, data gathering, functional analysis, strategic analysis, and decision maker. The framework will demonstrate how traditional intelligence practices and emerging technologies influence cyber intelligence; empowering students to assess the likelihood of cyber threat actors executing attacks, the impact attacks have on an organization's business, and the risk threats pose because of an organization's known vulnerabilities.

PREREQUISITES: None

14-812: Special Topics: Research Seminar in Privacy and Security (12 units)

This course is a graduate level research seminar that educates students about the latest breakthroughs and research challenges in security and privacy. The course helps to familiarize students with research terminology as well as the current topics in security and privacy. Students are expected to read recent and cutting-edge research papers in security and privacy, write critiques analyzing the research in the papers, present in class a summary of the research, and lead a class discussion. In addition, students will be working on a semester-long group research project where they are expected to conduct research on a project of their choice, present their research in class, and write a research paper. This course will enhance the research skills and critical thinking of students as they will learn how to criticize current research and how to handle open-ended problems. Students will also learn how to communicate and present technical challenges and participate in thought-provocative discussions.

PREREQUISITES: None

14-813: Special Topics: Projects in Privacy Enhancing Technology (12 units)

Data protection has become too cumbersome for citizens to manage on their own. One response to technologies that erode privacy and security is to craft new technologies to protect privacy and security. In this course we will learn how Privacy Enhancing Technologies (PETS) fit into the larger privacy landscape, discuss challenges faced by authors and users of privacy and security tools, and identify several common categories of PETS. We will evaluate several existing PETS as a class: what is their audience, how well do they work in practice, what usability issues do they present, and how well do they work technically? You will then work individually or in small teams of your choice. Students will select existing PETS to perform analysis of audience,

usability, and technical reliability. After identifying deficiencies, students will suggest improvements, implement a subset of those improvements, then perform human subjects or other technical research to validate their proposed changes actually do improve upon the existing PETS. Where possible, students will make suggestions back to the PETS developers. Programming skills are useful but not required as students can contribute in a variety of additional ways including documentation, installation packages, or user interfaces. A basic understanding of Internet and networking technologies is assumed.

PREREQUISITES: None

14-814: Wireless Security (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.

PREREQUISITES

(18-631 or 18-730 or 14-741 or 15-330 or 18-330) and (14-740 or 14-760 or 18-841 or 18-741 or 18-756 or 15-641)

14-815: Entrepreneurship and Innovation in Technology (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.

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: (18-240) and (15-513 or 18-213)

14-820: Special Topics: Security and Fairness of Deep Learning

This course will provide an introduction to deep learning methods with emphasis on understanding and improving their security, privacy, and fairness properties. The course will cover basics of machine learning and introduce popular deep learning methods. It will delve into applications of deep learning methods in security, their susceptibility to adversarial manipulation, and techniques for making deep learning robust to adversarial manipulation. It will cover state-of-the-art methods for explaining black-box deep learning models to enhance their transparency. It will also examine methods for deep learning that are designed to respect individual privacy and fairness. Students will do homework assignments, critique weekly readings, and complete a course project on a topic of their choice. Prior knowledge of machine learning, deep learning, and security concepts are useful but not required.

PREREQUISITES: None

14-821: Special Topics: Legal and Ethical Background for Those Working in Cyber Ops (12 units)

In this online 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. This is a text-based online course with online evaluation via quizzes, which you may take at your own pace. There are no projects or final exam, but please expect to invest substantial time into reading both legal and technical texts.

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: (18-631 or 18-730 or 14-741) and (14-740 or 18-756 or 15-641)

14-832: Cyber Forensics Capstone (12 units)

Spring: 12 units. The CyFIR concentration capstone course challenges students by placing them in a series of hands-on exercises based on real world scenarios. Students will work together in groups to respond to and investigate large-scale corporate and government intrusions. Instructors will teach advanced event correlation and reconstruction techniques as well as emerging data collection and analysis approaches. 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 organizations. Prerequisites: 14761, 14822 and 14823.

PREREQUISITES: 14-761 and 14-822 and 14-823

14-840: Mobile Hardware for Software Engineers (12 units)

This course enables students to analyze the implications of mobile hardware capabilities and restrictions in order to plan and develop mobile applications. Students will be able to devise and interface simple hardware additions to mobile platforms such as cell-phones, internet tablets and wireless sensors. The course covers the elements of embedded systems development, such as hardware fundamentals, real-time operating systems, interrupts, and cross-development, as well mobile topics such as power management, machine-to-machine communication, radio/RF subsystems and wireless protocols. Topics typically include: USB, GPIO, blue-tooth, cellular networks, 802.11, Zigbee, RFID, NFC, cameras, audio, etc. Student teams will undertake small HW/SW interfacing projects to sharpen their experience. Unlike a conventional hardware course, the course would instead focus on the software implications, rather than the CPU and radio. Prerequisites: Some understanding of basic electrical terminology and Java programming required; C programming desired.

PREREQUISITES: None

14-841: Mobile and Pervasive Computing (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.

PREREQUISITES: 15-605 or 15-410

14-848: Cloud Infrastructure: Design, Analysis and Implementation (12 units)

Cloud Computing can loosely be defined as the delivery of services via often on-demand and fluidly scalable shared resources. This course explores the design and implementation of the full-stack of hardware and software necessary to implement the infrastructure for elastic, global-scale computing and storage clouds. Upon completion of the course students are expected to be able to design, implement, and analyze the infrastructure underlying cloud-based services. Topics include Data Center Networking; Distributed File Storage; Distributed Key-Value storage, including NoSQL Databases; Virtualization, and the management thereof; Resource Scheduling and Elasticity; Map-Reduce engines, and higher-level Frameworks. The course involves discussion based upon recent and landmark papers, as well as existing tools and software systems. It has a very substantial programming project component in which students design, implement, and analyze various aspects of cloud infrastructure.

PREREQUISITES: None

14-850: INSuRE Cybersecurity Research (12 units)

This course engages students in real-world cybersecurity and information systems security problems of interest to government organizations and industry partners. Students will learn how to apply research techniques, think clearly about problems and constraints, formulate and analyze potential solutions, evaluate solutions through simulation and experimentation, and communicate their results effectively. Working in small groups under the mentorship of technical clients from government and industry, teams of students will formulate, carry out, and present original research on current cybersecurity/information assurance problems of interest. Project topics come from lists supplied by government and industry partners. The course will be synchronized with similar offerings at several partner schools via videoconference, using resources provided through the INSuRE program. The course will be open to graduate students in computer science and engineering (e.g., INI, CS, ECE, Information Systems, etc.) who have background in

information security / information assurance and have significant expertise in at least one relevant technical area. All students will be initially waitlisted for the course until instructors have the chance to verify student qualifications beyond the basic prerequisites.

PREREQUISITES: 18-730 or 14-741

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/
- 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

Hanan Hibshi

Research and Teaching Scientist, 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

Limin Jia

Assistant Research Professor, INI and ECE

Ph.D. in Computer Science, Princeton University
B.E. in Computer Science and Engineering, the University of Science and Technology

Gregory Kesden

Associate Teaching Professor, INI

M.S., Computer Science, 1999, Clemson University
B.S., Computer Science, 1996, Clemson University

Aleecia McDonald

Assistant Professor of the Practice, INI

Ph.D. in Engineering & Public Policy, 2010, Carnegie Mellon University
M.S. in Engineering & Public Policy, 2008, Carnegie Mellon University
M.S. in Public Policy and Management with a concentration in Internet Policy, 2006, Carnegie Mellon University
B.A. in Professional Writing, 1993, Carnegie Mellon University

Patrick Tague

Associate Research Professor, INI and ECE
Associate Director, INI

Ph.D., Electrical Engineering, 2009, University of Washington
B.S. degrees in Mathematics and Computer Engineering, 2003, University of Minnesota

Pei Zhang

Associate Research Professor, INI, CyLab and ECE

B.S., Electrical Engineering, 2002, California Institute of Technology
M.A., Electrical Engineering, 2008, Princeton University
Ph.D. degree in Electrical Engineering, 2008, Princeton University

For more information on the INI faculty please refer to the INI website at INI:
<https://www.cmu.edu/ini/about/team/inifaculty.html>

In addition, INI has a number of adjunct instructors who are leading experts in their field. Below is a list of INI adjunct instructors.

William Reed

Adjunct Instructor, INI, Carnegie Mellon University
Cyber Security Engineer - Exercise Developer, CERT, Software Engineering Institute, Carnegie Mellon University

M.S. Information Security and Assurance, 2015, Carnegie Mellon University
B.S. Computer and Information Sciences, General, 2004, Franciscan University of Steubenville

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

Alexander Volynkin

Adjunct Instructor, INI
Senior Principal Scientist at ShieldAI

Ph.D. Electrical Engineering, 2007, Binghamton University
M.S. Computer Science, 2003, Binghamton 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
- Academic Integrity Website: 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: <http://www.cmu.edu/student-affairs/theword/code.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, 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.

The Statement of Assurance is also available online at: <https://www.cmu.edu/student-affairs/theword/statement/index.html>.

Admissions & Enrollment Policies

Deferral Policy

The INI does 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.

Applicant's Responsibility

It is the responsibility of the applicant to provide all required information on the program application and to submit all requested supporting documents in the manner stated on the INI website or requested by the Admissions Staff.

An application may remain "Incomplete" if required documents are not received in the INI office or are not submitted in the proper manner. Applications not completed by the posted deadlines will remain incomplete.

The admissions staff makes every effort to assist applicants in completing their submission; however, the INI does not accept responsibility for documents that are missing or are improperly submitted resulting in an application remaining incomplete and un-reviewed.

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 should be uploaded to the online application. Applicants should not upload WES reports; they are not accepted unless requested. Admitted applicants who accept enrollment must be prepared to show Proof of Graduation from their undergraduate program. Proof includes final official transcripts and degree certificate and/or diploma submitted no later than the end of July 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. Failure to submit proof of graduation can result in termination of enrollment.
- Three letters of recommendation (online only)
- Official GRE General Test scores
- Official TOEFL scores for applicants whose native language/mother tongue is not English

International Students

The INI admits students from other countries. All foreign students must obtain an F-1 or J-1 visa in order to attend CMU. Required documents are processed through the Office of International Education (OIE) which acts as sponsor of foreign students entering CMU. Incoming students are instructed of the necessity to pay for shipping of their I-20 certificate or DS-2019 certificate.

All foreign students originating in countries where English is not the native language/mother tongue must demonstrate English language proficiency in one of the following ways:

- 1) Results from the internet-based Test of English as a Foreign Language (TOEFL), minimum acceptable score is 80;
- 2) Results from the International English Language Testing System (IELTS), minimum acceptable score is 7;
- 3) Attendance at a U.S. University in a four-year undergraduate program. Students may obtain a waiver of the test requirement; decisions are made on a case-by-case basis.

For students who have had the TOEFL or IELTS waived, 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).

Domestic Student Qualification

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.

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 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 and MSIT-MOB programs.

The INI does not award credit for prior experiential learning to student enrolled in the MSIT-MOB and MSIT-IS 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/>.

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. 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>.

- 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.

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 for Poor Performance

At the end of each semester, the academic performance of each student is reviewed after final grades have been posted. The GPA for academic review is computed based on the guidelines for graduation requirements.

It is the sole responsibility of the student to set up a meeting with their academic advisor after receiving notification that they have been placed on academic probation. This meeting should occur within 14 days after receipt of the letter. The student and advisor are required to meet and sign the letter. The signed letter must be returned to the INI Director's Office within that timeframe.

Any student with a core and/or cumulative GPA of less than 3.0 is immediately placed on academic probation and may be subject to the following penalties:

- May have any 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 automatically be removed from probation during the next academic review if their core and cumulative GPAs are 3.0 or better at that time, unless the student has committed an academic integrity violation. The student's scholarship or financial award will be reinstated for the 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 they have a core or cumulative GPA 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. The student is not entitled to a refund of tuition or student fees unless the decision is overturned. 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 University are engaged in intellectual activity consistent with the highest standards of the academy. The relationship between students and instructors, along with their shared commitment to the 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 as well as the professional and personal communities that we lead. Because of this, we hold a deep and abiding commitment to academic integrity, as it 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 in all members of the Carnegie Mellon community.

The INI adheres to Carnegie Mellon's policy on academic integrity. The complete policy can be found at the following link: <https://www.cmu.edu/policies/student-and-student-life/academic-integrity.html>.

The INI adheres to the CIT's policy on graduate student academic integrity violations. The complete policy can be found at the following link:

<https://engineering.cmu.edu/education/academic-policies/graduate-policies/index.html>

INI Student Penalties for Violating Academic Integrity

In addition to the course-level action imposed by the instructor, a student at the INI will be placed on academic probation for the remainder of the INI program and will be subject to the following penalties:

- The student will have any scholarships and/or financial awards awarded by the INI rescinded immediately including those received in previous semesters;
- The student cannot be selected to receive awards, fellowships or scholarships for the duration of the INI program (including Scholarship for Service and other federal awards); and
- The student may not formally represent INI as an officer or other position in a student club or campus organization for the duration of the INI program.

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, he/she will be re-enrolled.

Students who want to appeal an academic disciplinary action must state in writing to the provost their intention to do so within one week of the penalty date in question, and then must submit their written appeal to the provost no later than two weeks after said penalty date. Appeals must be in writing, with appropriate documentation.

If a student is appealing to the provost, he or she must schedule a mandatory meeting with the INI Director within one week after the provost's decision has been released. If a student is not appealing to the provost, he or she must schedule a meeting with the INI Director as soon as possible.

In extreme cases where a first violation is particularly deplorable as determined by the INI Director, a student may be permanently dropped from the INI. Upon second academic integrity violation, the student will be permanently dropped from the INI, even if an earlier offense has not been fully processed.

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/MOB programs 2019-2020 (while on SV Campus)

	Entire Program (SV Campus)	First Semester	
Program Tuition*	\$43,750	\$21,875	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	\$872	\$436	Non-Refundable after the 10th class day of the relevant semester. See Refund Policy provisions.
Technology Fee	\$430	\$215	
Student Activity Fee	\$218	\$109	
Transportation Fee	\$224	\$112	
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 (\$.00 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	\$46,834
ESTIMATED TOTAL FEES/CHARGES FOR FIRST SEMESTER	\$23,417
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 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). The Commission may be contacted by telephone at 267-284-5000 or via email at info@msche.org or 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
Website: 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
Website: 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
Website: 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
Website: 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.

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 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 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 2018-2019 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 2017 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, 2018.

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 Fullbright 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.

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 http://www.cmu.edu/student-affairs/dean/assets/2017-2018_Alcohol_Drug_Brochure.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.
- 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 (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/MOB programs, 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 the Director of Student Affairs, Sari Smith, 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. Sari Smith's office is located in B19 Room 1041, and can be reached by phone at 650-335-2846 or email at sari.smith@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 19, Room 1040.

Health/Personal Concerns

The Director 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 Director 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 their school google accounts set up) 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 Assistant Dean of Student Affairs, Lauren Schachar or Career Consultant 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 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 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/BySIZMoB6txYDKz02>.

A list of employment positions within the education field for the INI MSIT-IS and MSIT-MOB programs graduates as of 2017 is available at:

https://www.cmu.edu/ini/academics/academics_docs/2018MSITEmploymentPositions.pdf.

The INI Career Services disclosure statement is available online at:

https://www.cmu.edu/ini/academics/academics_docs/BPPECareerServices_MSIT-2018.pdf

Visa Services

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

Housing

The CMU campus in Silicon Valley does not offer any on-campus housing or off-campus housing assistance. Students need to find their own housing. There is availability of housing, however, as many apartment complexes and/or room rentals are located within a commutable distance from the campus. Housing costs vary, but the average price for a 2 bedroom apartment is \$3300-\$3800/month. Most students choose to have roommates. 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 Director of Student Affairs at 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. We occupy two buildings, building 23 and building 19.

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 lab space.

Building 19 is a multi-tenant building in which CMU occupies 16,225 sq. ft. of space. It houses student-facing staff offices, student study rooms, Ph.D. student space, research space and an assortment of other types of space: 7 staff offices, 18 student study rooms, 6 PhD rooms with individual workstations, and 9 research labs, as well as 8 conference rooms, 1 kitchen/break room, a quiet room, a student organizations room and a large student lounge.

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 and upstairs Room 227. In B19, students can utilize the Bay Room (B19 Room 1040.)

Masters Suites and PhD Wing: Building 19 has 10 Master's Suites which can accommodate 6-12 students per room. The PhD wing has 8 rooms which hold 8 cubicles. PhD students are assigned a cubicle and given a key to the room and the desk upon arrival.

Labs: There are two labs on campus that are attached to Building 23. The Carnegie Mellon Innovations Lab (CMIL) is the larger general-use lab. Bench space is shared. Lab access is a privilege, not a right. It requires training, respect for access controls, and adherence to/signature on the written lab policies. CMIL contains the following equipment for personal and course projects: Ultimaker 2+ 3D printer, Oscilloscopes (40 MHz and 200 MHz,) regulated DC power supplies, 5MHz Function Generator, Agilent digital multimeter, ESD safe electronics work area, soldering irons, Weller rework station, Various hand tools. The Connected Embedded Systems (CES) lab is the "inner" lab and is for Prof. Iannucci's students only (GA and PhD only- not for classes.) Special access controls and monitoring are in place in this lab. Completed training, signing of written lab policies and approval by Professor Iannucci are required for access to this lab.

Printers: Printers are for use in Building 23 (B23) Room 123, the hallway in B23 outside of 109/110, the Building 19 (B19) kitchen/lounge, and at the end of the 1030 wing in B19. Instructions for adding printers and policies are posted next to each printer.

Keys: The Silicon Valley Facilities department will provide each Master student with a key to the Master's study suites in Building 19 at orientation. Each PhD student will be provided with a key to their cubicle and office in the PhD wing. To avoid any financial implications to you, your key 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.

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>.

Library and 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, Head, CMU Science Libraries at matthewm@andrew.cmu.edu or by phone: 412-268-7212

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, 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.

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/MOB 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.