# Table of Contents

Table of Contents ................................................................. 1  
Welcome to the Mechanical Engineering Department! ......................... 3  
1.0 Mechanical Engineering Undergraduate Curriculum ........................................ 4  
2.0 A Tour of the Department .................................................................................. 7  
3.0 Creating a Schedule ........................................................................................ 9  
4.0 Academic Support Services ............................................................................. 14  
5.0 Libraries ............................................................................................................ 17  
6.0 Computing Resources ...................................................................................... 18  
7.0 Supply Resources ............................................................................................. 20  
8.0 Undergraduate Student Organizations .............................................................. 21  
9.0 Gaining Experience .......................................................................................... 23  
10.0 Searching for a Job .......................................................................................... 27  
11.0 Graduate Education ......................................................................................... 28  
12.0 Other References ............................................................................................. 30  
Flowchart of Prerequisites .................................................................................. 31  
Curriculum Template ............................................................................................. 31  
Frequently Asked Questions ............................................................................... 37
Welcome to the Mechanical Engineering Department!

Congratulations on your choice of major and welcome to the Mechanical Engineering program.

At Carnegie Mellon, we emphasize a core sequence and a flexible curriculum for our engineers’ education, a program designed to provide a solid foundation to successfully meet future real-world challenges. As engineers adapt to rapidly changing technologies, it is important to retain and highlight the intellectual rigor and scientific base of engineering. The department continues to increase the “hands-on” component of the learning process and develop stronger ties to industry.

The purpose of this handbook is to answer many day-to-day questions, including topics such as advising, department operations, course selections, libraries, undergraduate research, computer and laboratory resources, summer internships, job searching and graduate school options. While this handbook does not cover everything you will need to know in order to be successful at Carnegie Mellon, it is intended as a helpful reference.

All undergraduates in the department are enrolled in the Mechanical Engineering Undergraduate Blackboard Site – www.cmu.edu/blackboard/. This site contains useful information for current students, including information about class registration, commencement, advising, announcements, events, class advertisements, and other topics.
1.0 Mechanical Engineering Undergraduate Curriculum

1.1 The Program at a Glance

We offer a four-year B.S. program in mechanical engineering, which is the second largest engineering discipline taught at Carnegie Mellon. A core of required courses covers fundamental material that all mechanical engineers should know, but elective courses build a program suited to individual goals and interests.

Through our curriculum, students receive a solid scientific foundation from the start. During their first year, students take courses in mathematics, physics, computer programming, and chemistry. In addition, students also take two introductory engineering courses which expose them to the different engineering departments. Our mechanical engineering introductory course is project-oriented; students learn about the various disciplines of mechanical engineering through lectures, laboratories, and hands-on projects.

In their sophomore and junior years, students take core engineering courses to develop strong engineering fundamentals. These course topics include:

- Solid and Fluid Mechanics
- Thermodynamics
- Heat Transfer
- Dynamics
- Systems and Controls
- Design Methods and Skills
- Experimentation and Numerical Methods

Notwithstanding the demands of the program, our undergraduate curriculum is flexible and allows students to begin taking elective courses early to pursue individual interests. We recognize the broad role mechanical engineers play in society—as leaders in business, government, and law. Therefore, we offer elective options that enable students to:

- begin taking elective courses during their junior year
- specialize in a particular area of mechanical engineering
- emphasize a technical area within another engineering or science department
- pursue interests in another Carnegie Mellon department (such as foreign language, design, music, or business)
During their senior year, students take electives, a mechanical systems experimental class and a capstone course in engineering design. In these courses, students work on teams to develop prototype hardware for new products. These projects expose students to the design process, from concept to product, and emphasize effective writing, speaking and presentation skills, as well as engineering ethics. Past design projects include:

- rehabilitative knee brace
- high efficiency engines
- interactive kickboxing target
- UV water purifying bottle

1.2 Educational Objectives

According to ABET (http://www.abet.org/) which evaluates applied science, computing, engineering and technology programs for accreditation, “program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation.” In view of this definition, the Mechanical Engineering program at Carnegie Mellon has the two following program educational objectives:

- Graduates distinguish themselves as innovative problem solvers and leaders in multidisciplinary settings, making use of a high quality and rigorous technical education that is enriched by a flexible curriculum and interdisciplinary research opportunities.
- Graduates excel in diverse career paths in either the engineering profession or an alternative field, or succeed in graduate studies.


The undergraduate curriculum offers our students significant opportunities to pursue directions of personal interest, including minors, double majors, participation in research projects and study abroad. Design and teamwork experiences occur at regular intervals in the curriculum, and graduates have significant hands-on experience through laboratories and projects. As a result, the department’s faculty have endorsed the following set of skills, or expected outcomes, upon graduation.

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multi-disciplinary teams
- An ability to identify, formulate and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
• A broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context

• A recognition of the need for, and an ability to engage in, life-long learning

• Knowledge of contemporary issues

• An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

1.3 Flexibility in the Curriculum

A major feature of the department’s curriculum is a reduced number of required courses and a greater variety in electives. Our curriculum is intended to provide students with greater flexibility and allow specialization in a wider variety of fields than previously possible. Mechanical engineers are diverse, and the department seeks to meet the modern needs of both students and industry.

The “core” curriculum is required of all students and contains essential material for all mechanical engineers. The “elective” curriculum is designed by the student in close collaboration with the student’s academic and faculty advisors. Through electives and special programs, students can pursue their personal interests inside and outside the department. Students are required to take at least one elective within Mechanical Engineering and five other electives. Four of these five can be any courses except for ROTC and physical education courses, and one can be any course that is offered by the university. The six electives can be allocated in a highly customized manner in order to meet the needs of each student’s particular interests, skills and career choice. There are many opportunities for constructing minors, double majors or double degree programs.
2.0 A Tour of the Department

Scaife Hall houses the Mechanical Engineering Department’s main offices, faculty offices, classrooms, graduate student and teaching assistant offices, and the design laboratory.

- The department’s main offices are located on the fourth floor of Scaife Hall (SH 402). Important contacts include:

<table>
<thead>
<tr>
<th>Department Head</th>
<th>Professor Allen Robinson</th>
<th>SH 401</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Business Manager</td>
<td>Dorothy Antonucci</td>
<td>SH 403</td>
</tr>
<tr>
<td>Academic Advisors</td>
<td>Bonnie Olson</td>
<td>SH 416</td>
</tr>
<tr>
<td></td>
<td>Eva Mergner</td>
<td>SH 415</td>
</tr>
</tbody>
</table>

- Bonnie and Eva can assist with class registration, tracking of progress towards degrees, curriculum questions, degree requirements and other undergraduate administrative issues. The usual office hours are Monday through Friday, 9:00 a.m. – 5 p.m. with a mid day lunch break. Most of the year, walk in advising is acceptable but students are encouraged to schedule an appointment using this link: http://www.meetme.so/MechEAdvisors

- The department’s conference rooms are on the second floor of Scaife Hall. Graduate Seminars with large audiences are held in lecture halls across campus. Flyers are posted indicating the seminar’s topic one week before the event. If something looks interesting to you, feel free to attend the seminar.

- The first floor of Scaife Hall houses the Office of the Dean of the College of Engineering, James Garrett. Important contacts for undergraduate students include:

<table>
<thead>
<tr>
<th>Dean of College of Engineering</th>
<th>James Garrett</th>
<th>SH 110</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Dean of Undergraduate Studies</td>
<td>Annette Jacobson</td>
<td>SH 110</td>
</tr>
<tr>
<td>Assistant Dean of Undergraduate Studies</td>
<td>Kurt Larsen</td>
<td>SH 110</td>
</tr>
<tr>
<td>Associate Director of Undergraduate Studies</td>
<td>Treci Bonime</td>
<td>SH 110</td>
</tr>
<tr>
<td>Administrative Coordinator for Undergraduate Studies</td>
<td>Kourtney Bandish</td>
<td>SH 110</td>
</tr>
</tbody>
</table>

Hamerschlag Hall is home to the department’s main machine shop, student shop, instructional computer cluster, additional graduate student and teaching assistant offices, research laboratories and many of the undergraduate instructional laboratories.

- The department’s laboratory office is located in HH C124, with the machine shop next door in HH C123. Jim Dillinger is the shop foreman. He is the point of contact for most design or fabrication work.
• The department’s instructional computer cluster is on the same level in HH C101. This cluster is supported through the department and is available for exclusive use by MechE undergraduate and graduate students. There are also some public clusters, listed on the university website, that support course software. The course instructor should be consulted for specific locations. The MechE cluster is available 24 hours a day and requires electronic access through students’ university-issued student ID card. The ECE Computing Services group handles computer issues for Mechanical Engineering. Information posted in the cluster indicates help/gripe procedures.

• The undergraduate instrumentation laboratory (HH B mezzanine level during construction) is heavily used by a number of courses. It is divided into both Thermal-Fluids and Mechanical Systems areas for 24-321 Thermal Fluids Experimentation and Design and 24-452 Mechanical Systems Experimentation.

• Other laboratories, which are used for undergraduate courses, are also located in Hamerschlag Hall, including robotics, manufacturing, stress analysis and microfluids.

• The Internal Combustion Laboratory is located in FMS 121.
3.0 Creating a Schedule

3.1 Planning Your Schedule

Through the department’s curriculum, students select a number of electives either from within Mechanical Engineering or from areas outside the department or college. This allows flexibility in tailoring your course of study to your long term career goals. However, this also requires efficient and early curriculum planning.

You should plan your schedule with your long-term view in mind. If possible, try to outline a plan for your entire undergraduate program, not just the courses that you will take during the upcoming term. Early on, think of potential options, minors or double major opportunities. Think about how you can best utilize the available electives. Industry is increasingly finding that engineers with special skills—for instance, business, language, writing or information sciences—are becoming more important as companies compete in the international marketplace.

All mechanical engineering students have elective slots within their schedules during their junior and senior years. There are many options, and the first “design problem” that you will solve as a student involves outlining a constructive plan of study. Students can develop a deeper focus within Mechanical Engineering by using these elective slots to take additional courses offered by the department, or they can choose from the list of mechanical engineering technical electives or from the list of the department’s graduate courses.

The following are examples of degree paths chosen by past students:

- Scott would like to keep his options open after graduation. He might go to graduate school or take a traditional engineering job in industry. He decides to use his electives for mechanical engineering courses. In addition to the one required technical elective in mechanical engineering, he takes five additional electives of his choosing within the department. Advanced courses are available in such areas as controls, applied finite element analysis, manufacturing, internal combustion engines, fluid and solid mechanics, and engineering design.

- After graduation, Matthew would like to join a small startup company in robotics. He pursues the engineering college’s designated minor in the field of robotics, which is recognized on his transcript. He uses his electives to take two courses in mechanical engineering (Feedback Control Systems, and Soft Robots), and several other courses from the Computer Science Department and the Robotics Institute.

- Katherine is interested in technical issues that are related to national security, and she would eventually like to work for a federal government agency in that capacity. She decides to pursue a double major in mechanical engineering, and engineering and public policy. She completes the program in four years, as the double major program is constructed using the available elective slots without an overload of courses.

- After completing his B.S. in Mechanical Engineering, Juan plans to attend law school. He views an undergraduate engineering degree as a step towards his career goal as a patent lawyer. He takes two electives in design within the Mechanical Engineering Department
and uses the remaining electives for courses within the Political Science and Economics Departments to prepare him for law school.

- Angela would like to work for an American corporation in international sales and marketing. She would like to interact with customers in other countries and with a corporation’s oversea subsidiaries. Using the available elective slots, she takes several courses in modern languages. She knows that her combination of a technical background and foreign language skills will be attractive to potential employers.

### 3.1.2 Designated Minors

A minor allows you to develop a formal emphasis in an area outside of your major field but involves careful planning of your schedule. Formal recognition of your minor will appear on your transcript and in the commencement program.

The College of Engineering offers twelve “designated minors” with requirements described in the undergraduate catalog. Designated minors are available in the following areas:

- Automation and Control
- Biomedical Engineering
- Colloids, Polymers and Surfaces Technology
- Electronic Materials
- Environmental Engineering
- Materials Science and Engineering
- Mechanical Behavior of Materials
- Robotics
- Global Engineering
- Audio Engineering

These programs make effective use of your elective slots in the mechanical engineering curriculum. If you decide to pursue a designated minor, you can do so without overloading courses. Other minors outside of the College of Engineering might require an overload. In any case, early and careful course planning and consultation with your Academic Advisor is important.

### 3.1.3 Double Majors

With a double major, you satisfy the degree requirements for two separate majors, in two separate academic departments. Although you can pursue a double major in any department at Carnegie Mellon, including those outside of the engineering college, space constraints in some departments may restrict access to certain classes.

A double major in mechanical engineering and engineering and public policy is relatively common. This degree exposes you to many issues that are at the interface of technology and society and could prepare you for a career path including government regulation.

### 3.2 Academic Advising and Faculty Counseling

Initial first year planning and advising is handled by the CIT Undergraduate Studies Office. In March of your first year, after you select mechanical engineering as your major, Bonnie Olson (last
name A-K) or Eva Mergner (last name L-Z), MechE Academic Advisors, will be assigned as your advisor. They will continue to assist you with any curriculum questions and registration issues for the remainder of your studies.

During your sophomore year, you should begin planning your career at Carnegie Mellon in earnest. Rather than have a professor randomly assigned as your faculty mentor, you will have the opportunity to choose an advisor, if you prefer. Information on the MechE website, introductions at the sophomore dinner and faculty visits during sophomore classes will assist you with your selection. In the meantime, if a meeting with a faculty member would be helpful, arrangements may be made through the Academic Advisors. At the end of your sophomore year, if you have not already selected a faculty mentor, we will assign one to you.

In general, faculty will:

- Explain technical content of coursework and suggest concentrations appropriate to career objectives
- Discuss research and summer internship opportunities
- Offer graduate school and employment advice
- Offer general advice and mentoring

The Academic Advisors will:

- Verify progress toward degree requirements
- Discuss course alternatives for CIT requirements and electives
- Register research credit
- Assist with pre-requisite issues
- Offer basic information regarding double majors, minors, study abroad procedures, etc
- Explain summer transfer credit policies

Mentors are selected via an online survey in June following the sophomore year. You may change your mentor anytime; please email Bonnie (bonnieo@cmu.edu) or Eva (emergner@andrew.cmu.edu) or stop in SH 416/415 to officially designate the change of advisor on your records and verify that your chosen mentor can accept additional advisees. You can find your mentor’s contact information under Groups on the Mechanical Engineering Blackboard Site.

Prior to registration each semester, you will receive an email from the Academic Advisors, which is sent to all mechanical engineering students as a reminder of registration time for the next semester’s classes. Because of the large number of students, and the short time frame for specific registration advising, sophomores, juniors and seniors should schedule appointments with the Academic Advisors in the week designated on the memo using the online appointment scheduler.

Note that the responsibility for planning your schedule falls squarely upon your shoulders. If you do not plan your schedule wisely, you will find it difficult to satisfy the degree requirements or get the most out of your degree.
Academic advising is available year around from 9:00 a.m-5:00 p.m. An appointment is preferred but not usually necessary other than during peak registration cycles.

3.3 Registering for Classes

The registration procedures are outlined each semester in the Schedule of Classes that is distributed throughout campus.

You should note that all mechanical engineering courses, except for 24-101 Fundamentals of Mechanical Engineering and 24-441 Engineering Design II, are taught only once each year. The department attempts to schedule these courses so that there are no significant course conflicts. However, students do need to be aware of such scheduling constraints as they plan courses outside the major. These constraints are particularly important for students who plan to study abroad or those who may fall a semester behind in the program for some reason.

Procedures for adding, dropping and auditing courses are described in the Undergraduate Catalog and the Schedule of Classes.

3.4 University Policy on Cheating and Plagiarism

Students at Carnegie Mellon are engaged in preparation for professional activity of the highest standards. Each profession constrains its members with both ethical responsibilities and disciplinary limits. To assure the validity of the learning experience a university establishes clear standards for student work.

In any presentation, creative, artistic, or research, it is the ethical responsibility of each student to identify the conceptual sources of the work submitted. Failure to do so is dishonest and is the basis for a charge of cheating or plagiarism, which is subject to disciplinary action.

Cheating: According to the University Policy on Academic Integrity, cheating "occurs when a student avails her/himself of an unfair or disallowed advantage which includes but is not limited to:

- Theft of or unauthorized access to an exam, answer key or other graded work from previous course offerings.
- Use of an alternate, stand-in or proxy during an examination.
- Copying from the examination or work of another person or source.
- Submission or use of falsified data.
- Using false statements to obtain additional time or other accommodation.
- Falsification of academic credentials."

Cheating at Carnegie Mellon

In academic life, cheating can include copying someone else’s work, having someone else complete an assignment or take an exam for you, or stealing an exam or paper. Paying other students to do your work or buying papers is also prohibited. Submitting or using falsified data constitutes cheating as does lying to obtain additional time or other accommodation. And finally, falsifying
academic credentials including but not limited to internship documentation, letters of recommendation, transcripts, and diplomas is also considered to be a violation of university policy.

Of the 293 total number of academic integrity violation reports that were submitted to the Office of the Dean of Student Affairs during the 2014-2015 academic year, 38.8% were cases of cheating and carried a range of consequences. However, it is important to know that cheating is 100% avoidable and there are many strategies that both students and instructors can employ to prevent these types of violations from happening.

Plagiarism: According to the University Policy on Academic Integrity, plagiarism "is defined as the use of work or concepts contributed by other individuals without proper attribution or citation. Unique ideas or materials taken from another source for either written or oral use must be fully acknowledged in academic work to be graded. Examples of sources expected to be referenced include but are not limited to:

- Text, either written or spoken, quoted directly or paraphrased.
- Graphic elements.
- Passages of music, existing either as sound or as notation.
- Mathematical proofs.
- Scientific data.
- Concepts or material derived from the work, published or unpublished, of another person.

Plagiarism at Carnegie Mellon

In academic life, plagiarism can include failing to cite references in your work or not attributing ideas contained in your work to the original source of those ideas. It can occur when students cut and paste material from a web resource directly into their assignments or when they sample graphic or music files without attribution. Putting someone else’s ideas into your own words also requires the appropriate citation or it constitutes plagiarism.

Of the 293 total number of academic integrity violation reports that were submitted to the Office of the Dean of Student Affairs during the 2014-2015 academic year, 14% were cases of plagiarism that carried a range of consequences. However, it is important to know that plagiarism is 100% avoidable and there are many strategies that both students and instructors can employ to prevent these types of violations from happening.

For more information, visit [http://www.cmu.edu/policies/student-and-student-life/academic-integrity.html](http://www.cmu.edu/policies/student-and-student-life/academic-integrity.html)
4.0 Academic Support Services

Besides academic advising and faculty mentorship, many other resources are available at Carnegie Mellon to help students succeed in their studies. You should be familiar with the following:

The Career Center (Kevin Monahan, Director) provides career counseling. The Center helps graduating students who are seeking employment with resume preparation, interview skills and contacting potential employers. In addition, the Center can also assist you in choosing or confirming a choice of major and minor areas, clarifying a career choice, or planning for graduate school.

- Lisa Dickter is the CIT (ME) Career Counselor (appointments available through Handshake: https://cmu.joinhandshake.com/login)
- Located in Career and Professional Development Center - Advising Center - West Wing 2nd Floor
- http://www.studentaffairs.cmu.edu/career/college-specific-resources/cit.html
  (412) 268-2064

Health Services (Beth Kotarski, Director) is staffed by a physician, nurse practitioners, and registered nurses. It is located in Morewood Gardens E-Tower. Appointments are required, but walk-in urgent care is available.

- Call (412) 268-2157 for general clinic questions
- For a non-urgent appointment use HealthConnect
- For medical emergencies, contact campus police at (412) 268-2323

Counseling and Psychological Services provides opportunities to talk about personal or academic concerns. Counseling sessions are free and confidential.

- Call (412) 268-2922 for an appointment
- Crisis intervention available 24 hours a day (call above number)
- Located on the 2nd floor of Morewood Gardens E-Tower

The Office of Academic Development (Linda Hooper, Director) provides assessment and instruction on study skills including textbook reading strategies, lecture note taking, test anxiety, test preparation, and time and stress management. Students often have difficulty with courses due to weaknesses in one or more of these skills, and by addressing them early, you can take an important first step towards improving classroom performance. The center also provides tutoring in calculus, biology, chemistry, physics and writing, geared primarily toward large introductory courses.

- For appointments: (412) 268-6878 or academic-development@andrew.cmu.edu
- www.cmu.edu/academic-development
- Located in Cyert Hall B5

The Global Communication Center (Johanna Wolfe, Director) (GCC) is a tutoring resource supporting students' efforts to improve their written, oral, and visual communication skills. Support is available for any student, at any level, in any discipline, at any stage of the composing process. Free one-on-one tutoring for academic communication projects is available on
the ground floor of the Hunt Library. Please bring electronic copies of your instructor's assignment prompt and any materials you have prepared.

- For appointments: [http://www.cmu.edu/gcc/appointment/index.html](http://www.cmu.edu/gcc/appointment/index.html)
  Email: gcc-cmu.edu@andrew.cmu.edu
- Located in First Floor of Hunt Library

**The Carnegie Mellon Advising Resource Center (CMARC)** supplements and supports the faculty and department-specific advising system, serving as an additional student resource in times when it is necessary to consult more than one person or to obtain another perspective. The center has an additional commitment to support underrepresented ethnic minority students. CMARC advisors can help students learn how to design a well-balanced schedule, interpret university policies and procedures, establish short and long term academic goals, understand requirements for majors and minors, investigate alternative majors in other colleges, enhance awareness of available resources, such as internships and research opportunities and honors and tutoring programs, explore career and graduate school options, and obtain referrals to organizations such as Career Services, Academic Development, Student Affairs, and Disability Resources.

- [www.cmu.edu/cmarc/](http://www.cmu.edu/cmarc/)  CIT advisor- Ty Walton
  - Located in Cyert Hall A-64

**The Office of International Education** (Linda Gentile, Director) is the primary contact point for all students and scholars not United States citizens or permanent residents. The Study Abroad Office (Chris Menard, Study Abroad Advisor, 412 268-4969) has a reference library of over 3,000 available programs, including information on funding.

- (412) 268-5231
- Located in Warner Hall 301

**The Intercultural Communication Center** is a support service offering non-credit classes, workshops and individual appointments designed to equip nonnative English speakers (international students as well as students who attended high school in the U.S.) with the skills necessary to succeed in academic programs at Carnegie Mellon. In addition to developing academic literacy skills such as speaking, reading and writing, students can learn more about the culture and customs of the U.S. classroom.

- (412) 268-4979
- eslhelp@andrew.cmu.edu
- Located in Warner Hall 308
- [www.cmu.edu/icc](http://www.cmu.edu/icc)

Available programs:

- **Writing Clinic**: helps students with their academic writing assignments--this includes support with reading and interpreting source texts
- **Seminars and Workshops**: Includes Presentation Skills, Citing Sources, Improving Scientific Writing, and Reading Strategies
• **Tutoring**: individual appointments address specific areas such as speaking, listening, grammar and academic fluency

• **Placement Interviews**: evaluate spoken language so that appropriate ICC work can be suggested; also give students useful feedback on the strengths and weaknesses of their communication skills

• **The ITA Test**: a mandatory screening test for any nonnative English speaker (graduate or undergraduate) who plans to work as a teaching assistant

The **Students with Disabilities Office** provides qualified individuals with reasonable accommodations under the Americans with Disabilities Act (ADA). Carnegie Mellon takes great effort to provide physical and programmatic campus access to everyone. Individuals with documented disabilities may be eligible to receive services and accommodations from Carnegie Mellon's Equal Opportunity Services Office (EOS). To access services and accommodations, individuals must first refer themselves to the EOS office and provide adequate documentation of the disability.

The first step in this process is to complete a Voluntary Self-Disclosure of Disability Form and contact the Manager of Disability Resources to set up an appointment. Students may identify themselves as having a disability at any time. Accommodations are determined on a case-by-case basis. All information will be considered confidential and only released to appropriate personnel on a need-to-know basis.

- Contact Larry Powell at (412) 268-2013 or lpowell@andrew.cmu.edu
- access@andrew.cmu.edu

The **Fellowships and Scholarship Office** (Stephanie Wallach, Director) provides support to current Carnegie Mellon undergraduate students who are interested in pursuing external scholarships and fellowships. For certain awards, FSO also works with graduate students and alumni (Fulbright and the UK Awards found on the Prestigious Scholarships website). The office, located in Warner Hall 531, works with students to help them develop competitive applications, identifies and supports faculty and staff representatives for a select number of prestigious scholarships and fellowships, maintains a website of external scholarship and fellowship opportunities and manages campus selections processes.

The **Mindfulness Room** (Student Life) is located on the ground floor of West Wing. All Carnegie Mellon University community members have access. The Mindfulness Room is open 24 hours a day during the fall and spring semesters. Some of the relaxation features of this room include plants, a soothing waterfall wall, yoga mats, meditation pillows, and comfy seating. It is not a space for homework or technology or to be used for meetings or for work, but to recover and inspire yourself. It is not a reserve-able space.

The **Division of Student Affairs** supports and fosters intellectual and personal growth and helps students explore and experience the different aspects of college life. The link describes Campus Life (organizations, university lecture series), Health and Well-Being (fitness, wellness promotion) and Community Engagement (leadership, mentoring). [http://www.cmu.edu/student-affairs/](http://www.cmu.edu/student-affairs/)
5.0 Libraries

5.1 Libraries at Carnegie Mellon

There are a number of libraries at Carnegie Mellon, but the ones most commonly used by mechanical engineering students are:

- **Hunt Library.** This is the university’s main library.
- **Sorrells Engineering and Science Library** (Wean Hall, fourth floor). Major subjects include engineering, physics, mathematics, computer science and robotics. The reference staff is very helpful. For many departmental classes, copies of lecture notes, problem set solutions and exam solutions are placed on reserve at the circulation desk. Recommended reference books for some courses are also placed on reserve.
- **Mellon Institute Library** (4400 Fifth Avenue, fourth floor). Subjects include biology, chemistry, and other sciences.
- On-line electronic databases are provided and maintained by Carnegie Mellon’s libraries. Databases include the electronic catalog, which lists books and journals, journal references, a dictionary, encyclopedia, Who’s Who at CMU, and other resources.

5.2 University of Pittsburgh Libraries

Carnegie Mellon students can obtain a valid library card for the University of Pittsburgh libraries at no charge. The Pitt library card is available only at the Hillman Library, which is located on Forbes Avenue. The Pitt Engineering Library is located on the corner of Thackery and Benedum Streets.

5.3 Carnegie Library

Carnegie Mellon students can also use their student ID card to check out books at the Carnegie Library. You will find their excellent patent section to be useful.
6.0 Computing Resources

Computing resources are split into three basic levels: campus wide, departmental and research group. Campus wide resources, including workstation and personal computer platforms, are available for use by all members of the campus community. They are sometimes referred to as “public” clusters, located in buildings around campus. Departmental resources are available to undergraduate students, graduate students and mechanical engineering faculty and staff. In addition, research groups within the department have access to other computer resources available only to members of that group, for instance, in a faculty member’s laboratory.

As an undergraduate student, you have access to the public clusters and access by key card to the departmental cluster. If you become involved with a research project in conjunction with a faculty member, you might also have access to the computer system located in that faculty member’s laboratory.

Important computer resources outside the department include the public clusters located in Wean Hall 5202-5204 and the Baker Hall 140 complex. These clusters include Sun Unix machines which run ProEngineer, Ansys and all Andrew software including Matlab and Simulink. These clusters are sometimes reserved by mechanical engineering courses for work during laboratory or recitation sections.

6.1 Andrew Accounts

Andrew is a campus wide, Unix-based distributed computing system. Everyone on campus has an account. Andrew provides access to programming languages, word processing software, drawing packages, data analysis, email, Internet access, b-boards and numerous other applications. Laser printing services are available in most of the clusters. In addition, students have access to a Google Apps account (http://www.cmu.edu/computing/email/google/index.html).

Since everyone at Carnegie Mellon has an Andrew account, it has become a major tool for communication. Communication can be private, as with email, or public, as with b-boards. Many courses within the department have b-boards or web pages that are used for announcements, homework assignments, information on upcoming exams, posting questions and answers and for general discussion about the course. Instructors will tell you the b-board or website address at the start of a term.

The department’s main website is www.cmu.edu/me. Follow the links for additional information on the undergraduate program, graduate program, points of contact, faculty research areas and other pertinent facts. A preferred reference is the Mechanical Engineering Undergraduate Blackboard Site.
6.2 Department Computing Cluster

The department maintains a cluster in HH C101 where a number of personal computers (31 in the large room, 14 in the small room, 45 total) and workstations are located. Major software capabilities include ProEngineer Wildfire, Solidworks, Autodesk and Adams for design, Ansys for finite element analysis and Matlab for dynamic system and controls analysis. Hardware capabilities include 45 Windows XP computers with dual monitors, two scanners and three HP LaserJet printers.

In order to gain access to the cluster, you must swipe your university ID at the cluster door. Access to the computing cluster in HH C101 is available on a 24-hour, 7-days-a-week, basis to the entire department’s undergraduate and graduate students. Please remember that food and beverages are not permitted at any time in the departmental computing clusters.

The department also maintains computers in the Thermal Fluids/Mechanical Systems Laboratory (HH B121/123). Access to the laboratory is available only during scheduled course periods or by permission of a faculty member when working on a design or research project.

For word processing, email, Internet access and other standard computer operations, you are encouraged to use your own computer or those in the public clusters. Although the departmental cluster can be used for these purposes also, it is generally heavily utilized and is intended primarily for computer-aided engineering course work.
7.0 Supply Resources

Machine Shop

The department’s machine shop can handle the fabrication needs of almost any design or research project. Charges are made only through departmental charge numbers.

- Hours: 8:30 a.m. - 4:30 p.m., Monday-Friday
- Location: HH C124

Tool Room

The tool room is the storeroom for many tools and other supplies that you might need for design and research projects. You can use soldering irons, tachometers, voltmeters, and a wide variety of nuts, bolts, gears, bearings, and other supplies. You will need to sign out whatever you need and return it when you are done. This facility is frequently used for design projects in Fundamentals of Mechanical Engineering (24-101).

- Hours: 8:30 a.m. - 4:30 p.m., Monday-Friday
- Location: HH B134

Tech Electronics

Tech electronics contains a great variety of resistors, capacitors, switches, wire, wiring tools, circuit boards, integrated circuits, discrete devices, transistors, and other electronic components. Parts catalogs are available, but it's helpful to bring a list of what you need. This is also the place where you can sign out such equipment as digital multimeters and oscilloscopes.

- Regular Hours: 9 a.m. - 5 p.m., Monday-Friday
- Location: HH 1301
8.0 Undergraduate Student Organizations

In addition to campus-wide organizations, you are encouraged to participate in professional and social activities sponsored by the department’s student organizations.

The Student Advisory Council (Advisor: Professor Rabin) utilizes representatives from the sophomore, junior and senior undergraduate classes to provide feedback and recommendations to the department on new ideas and ways to improve the undergraduate program. Representatives are elected during the fall of each academic year.

The Society of Women Engineers is a college-wide activity that supports and promotes women in science and engineering. Activities include the Technical Opportunities Conference, a workshop to acquaint female high school students with engineering opportunities, and the “Engineering Your Future” workshop for Pittsburgh students in grades 8-11.

The American Society of Mechanical Engineers is an international organization for the profession, with a student chapter at Carnegie Mellon. Student membership offers the opportunity to develop skills and learn more about mechanical engineering. The chapter sponsors technical presentations by engineers in the industry, tours of companies and laboratories and social activities. Visit https://www.asme.org/about-asme for more information.

Tau Beta Pi is the national engineering honor society, and membership is offered to students who rank near the top of their class. Membership provides a good opportunity to meet fellow students in other departments.

The Society of Automotive Engineers (Advisors: Professor Shimada and Professor Singh) is open to any mechanical engineering student, and members participate in activities including building full scale and miniature vehicles. The chapter participates in national competitions each year, and sponsors presentations by engineers working in the automotive industry.


American Institute of Aeronautics and Astronautics (Advisor: Professor Singh) advances the state of aerospace science, engineering and technological leadership with more than 145 AIAA Student Branches, which now have over 5,000 members in 45 countries. The organization offers design competitions, scholarships, internships, research help, discounts on textbooks, and more.

Pi Tau Sigma, the International Mechanical Engineering Honor Society sponsors information sessions and events for the Mechanical Engineering (MechE) students, including Employer Breakfasts for MechEs as part of the Technical Opportunities Conference (TOC) http://www.pitausigma.net/
The National Society of Black Engineers (NSBE) is a 501(C)(3) non-profit association that is owned and managed by its members. The organization is dedicated to the academic and professional success of African-American engineering students and professionals. NSBE offers its members leadership training, professional development, mentoring opportunities, career placement services and more. https://sites.google.com/a/cmunsbe.org/cmu-nsbe/home

The Society of Hispanic Professional Engineers (SHPE) strives to increase the number of Hispanic engineering and science students at Carnegie Mellon University through the development of programs with industry, the university, and the community. The activities are designed to increase career awareness, encourage relationships with professionals, develop leadership skills, and promote academic excellence. SHPE also holds several fun cultural and social activities adjacent to SALSA. https://thebridge.cmu.edu/organization/society-of-hispanic-professional-engineers

The CMU Chapter of Society of Asian Scientists and Engineers (SASE) aims to prepare and strengthen Asian Pacific American scientists and engineers for their future careers by providing them with professional development and networking opportunities with both fellow students and professionals from various careers and backgrounds. http://www.cmusase.org/

Engineers Without Borders (EWB-USA) helps create a more stable and prosperous world by addressing people's basic human needs by providing necessities such as clean water, power, sanitation, and education. EWB-USA's strength comes from its over 250 dedicated chapters, including university chapters on 180 campuses in the United States. http://cmuewb.org/
9.0 Gaining Experience

9.1 Summer Work Experience

It is a good idea to get as much summer work experience (a summer internship entails working in your field) as possible while you are pursuing your degree. Your job prospects after graduation will be enhanced, and in addition, you will be able to see day-to-day application of the material that you learn in courses during the academic year.

Some companies will hire summer interns after they complete their freshmen year. However, as a student finishing your sophomore or junior years, you will have the best prospects of finding a summer internship. Any experience that you gain will be valuable, and it can provide a good pathway for finding a permanent job after you graduate.

The Career Center provides many internship resources for students in the College of Engineering. Students use these resources to search for a summer internship. For further information, you should contact the Mechanical Engineering Career Consultant, Lisa Dickter, at the Career Center, and also watch the department's bulletin board.

Other Resources include the Alumni/Student Advising Program launched by the Department of Mechanical Engineering. It is an online mentoring program that connects you with alumni for one-on-one career conversations. Whether you have a job interview coming up, need to give your resume a tune up, or want to learn about a career path, alumni are there to help. Register and connect with alumni today at: https://cmumech.firsthand.co/

Here is a brief overview of the process for finding a summer internship position:

1. **Prepare a resume.** Look at the CIT Career Center website (http://www.cmu.edu/career/college-specific-resources/cit.html) for sample mechanical engineering resumes and suggestions on how to write a resume. The Career Center has resume review sessions each fall and spring and will provide suggestions for how to make your resume stronger. Furthermore, you can obtain more specific information by arranging an appointment with Lisa Dickter, the Career Consultant for Mechanical Engineering. To arrange an appointment, either call the Career Center at 412-268-2064, login to Handshake, or stop by the Career Center in West Wing 2nd Floor.

2. **Attend one of the CIT Summer Internship Search Workshops.** These are normally scheduled in the latter half of the Fall semester and detail how to have a successful summer internship search. Look at the Career Center website for specific dates.

3. **Use Handshake.** One of the main resources for finding a summer internship involves using Handshake, (go to http://www.cmu.edu/career/ and click on one of the options
next to the word “Handshake”), which is a web-based application for finding out which companies are looking for interns and will either be interviewing on campus or are requesting that resumes be sent to them. This is the same system that is used for scheduling permanent job interviews in the senior year, so the sooner you learn how to use it the better.

4. **Network.** Students also find internships by networking with everyone they know, including parents, neighbors, friends, alumni and professors.

5. **Search the CIT Internship Database**, which has more than 400 summer internship opportunities

6. **Attend job fairs.** The TOC ([www.cmu.edu/toc](http://www.cmu.edu/toc)) held every September and the EOC ([http://www.cmu.edu/career/employers/career-fairs-employers/index.html](http://www.cmu.edu/career/employers/career-fairs-employers/index.html)) held every February are technical job fairs with hundreds of companies in attendance and will help students to connect with employers about internships.

7. **Utilize additional resources.** Additional resources to help students find internships include the Carnegie Mellon Alumni Database and the CareerSearch Database. Look at the CIT Career Center website for access details ([http://www.studentaffairs.cmu.edu/career/college-specific-resources/cit.html](http://www.studentaffairs.cmu.edu/career/college-specific-resources/cit.html)).

8. **Start early.** Finally, students find the most success in their internship search by starting early (fall semester), using several different search methods, sending out many (up to 50) resumes, meeting with Lisa Dickter, and by being persistent in their search!

### 9.2 Undergraduate Research Projects

Qualified students are encouraged to undertake individual research projects with the faculty. If you are interested in doing so, you should first contact faculty members with research interests and specialization that match yours. Look through faculty members’ web pages in order to find research projects of interest to you.

Substantial research projects can qualify for course credit (24-391/392 Mechanical Engineering Project) and department or research honors (24-491/492 Departmental Research Honors). Some opportunities are also available for paid summer research internships with the faculty.

In order to graduate with departmental research honors, a student must have a QPA of 3.2 or higher at graduation and complete 18 units of thesis research under 24-491 and 24-492 with a grade of B or better. A student who completes all requirements for the CIT research honors (QPA 3.5) (39-500- 18 units) will also receive departmental honors recognition at commencement provided the project is conducted under the supervision of a mechanical engineering faculty member.

It is also possible to obtain some funding to support undergraduate research projects. You can obtain information on the Small Undergraduate Research Grants program from the Undergraduate Research Office ([http://www.cmu.edu/uro/](http://www.cmu.edu/uro/)) located in WH 531.
9.3 Opportunities for Study Abroad

The department recognizes that a study abroad experience is a valuable part of an undergraduate education. Study abroad allows students to expand their horizons, immerse themselves in a vibrant new culture and gain new insights into their own way of life, all while earning a Carnegie Mellon degree. In addition, the College of Engineering offers a Global Engineering Minor to students that complete a study abroad experience. More information about the minor is available on the CIT website (www.cit.cmu.edu).

With careful planning, any mechanical engineering student in good standing may study abroad. A variety of study abroad options are available to students at Carnegie Mellon. Most of these programs focus on the student’s junior year, although the second semester sophomore year also represents an excellent opportunity to study abroad.

Planning your Study Abroad Experience

1. Review the university Study Abroad website for general background and information.

2. Attend an Information Session. There are several university wide information sessions held each semester and a department session in the fall. No reservation is required for these sessions.

In the fall semester, mini-information sessions are held in OIE on the 3rd Floor of Warner Hall several times throughout the semester. See the Study Abroad calendar for times and dates at https://cmu-sa.terradotta.com/. You may also call the Study Abroad receptionist at (412) 268-5231 to sign up.

3. Once you have attended an information session or are ready to start a detailed search, you should schedule an appointment with Bonnie Olson or Eva Mergner, the MechE Academic Advisors, to talk about promising programs that fit the constraints of the curriculum. Bonnie has compiled an MechE handbook of potential programs that allow study abroad without an additional semester at CMU and could save you valuable time researching options. The handbook is available on the undergraduate Blackboard site and the department website: http://www.cmu.edu/me/undergraduate/handbooks.html

4. You are also welcome to do independent research through the Carnegie Mellon Study Abroad website and the many study abroad web search engines such as www.iiepassport.org, www.studyabroad.com and www.goabroad.com. In addition to searching on the web, OIE (Office of International Education) has study abroad resource books that you can browse and photocopy and brochures that you can take. OIE is located on the 3rd Floor of Warner Hall. The Study Abroad Library is open during regular office hours, Monday through Friday 8:30 a.m. – 5 p.m.

If you are interested in a program, talk to Bonnie or Eva regarding the impact on your graduation date and scheduling of the MechE required classes. Please provide course descriptions of any Mechanical Engineering classes and applicable semester dates to begin the approval process or confirm current acceptance for pre-reviewed transfer credit.
5. You should also schedule an appointment with a study abroad advisor in OIE by calling the receptionist at (412) 268-5231. While Bonnie and Eva can assist with suggestions of where to study, and how your experience affects your CMU studies, all details about applications, housing, financial aid, etc. are handled at the University Study Abroad office in Warner Hall.

### 9.4 Professional Engineering Registration

Registration as a Professional Engineer in most states is a two-step process. The first step is to take the Fundamentals of Engineering exam to qualify as an Engineer in Training. The second step, four years after graduation and after successfully taking the fundamentals exam, is to take the Professional Engineers licensing exam, which involves qualified experience. Once you complete these steps, you will be registered as a Professional Engineer.

The department supports registration as a Professional Engineer. It is the opinion of many people that professional registration will continue to grow in importance for all engineers in the future. Thus, the department urges all of its students to take advantage of this process when they are students. Your student years are the best and easiest time to begin the process.

The Fundamentals of Engineering exam is standard and is recognized in most states. You are encouraged to take the exam as juniors or seniors. It is likely that you will never be better prepared!

In Pennsylvania, the FE exam registration is open year-round. The FE is a computer-based exam that is administered year-round in testing windows at NCEES-approved Pearson VUE test centers. The exam contains 110 multiple-choice questions and is 6 hours long. The best time for you to take the exam is probably in the Fall of your senior year. Additional information is available at [www.ncees.org/](http://www.ncees.org/).

### 9.5 Departmental Machine Shop Course

This course is a six-week course meeting for two hours per week, listed on the Schedule of Classes as two minis, starting the second week of classes and in the middle of each semester. Class is held in the student machine shop and is taught by the Mechanical Engineering Shop Staff. Registration in the shop class (24-200) is through SIO.

The Machine Shop course is required and should be completed in your sophomore year. The course carries one unit and is graded Pass/Fail. It familiarizes students with the operation and safety of machine tools and provides knowledge of what goes into engineering designs in building a prototype. For further details, contact Jim Dillinger (jimd@andrew.cmu.edu).

### 9.6 Tutorials for Specific Projects

Tutorials are brief guides that are linked to specific projects in undergraduate courses. They provide self-paced learning tools to help in computer-aided engineering (CAE) course assignments. Tutorials are designed to allow you to effectively work on projects using sophisticated engineering software without previous training in navigating the software interface. Tutorials are available for Matlab, Adams, MathCad, Mini-FEA, Solidworks, ZCorp, Pro Engineer and Ansys for assignments.
in mechanical engineering core classes and electives. Tutorials may be available at these links:

10.0 Searching for a Job

See 9.1 Summer Work Experience for detailed links.

It might seem early to you, but it’s never too soon to start thinking about your prospects after graduation. While at Carnegie Mellon, you have access to on-campus services that include career counseling, occupational information, job referral, summer employment assistance, credentials services and, perhaps most importantly, campus recruiting. Approximately 600 employers recruit each year on campus. Be sure to check out the Career and Professional Development Center: http://www.studentaffairs.cmu.edu/career/ for tips on seeking employment and information on graduate and professional schools.

Your success in obtaining a job post-graduation is influenced by a number of factors, including letters of recommendation from faculty, an important factor sometimes overlooked by students. Your course instructors or a project advisor are good reference sources. Usually, to receive a strong recommendation, the faculty member writing the letter needs to know you personally. You can develop good relationships with faculty by showing sincere interest in your courses, asking good questions, and discussing course material during office hours.

Employers always want to hire people who demonstrate initiative and leadership qualities. It is best to have your references established by the beginning of the senior year. Be sure to ask your selected faculty members if they are willing to write a reference letter before you list their names on your resume or job application. Faculty can provide you with a stronger reference if they have a copy of your resume and have had a chance to talk to you about your career goals.

You should start the job search early in your senior year and take advantage of the on-campus Technical Opportunities Conference. Begin by assembling your resume, organizing your references and contacting the career center. Lisa Dickter, the MechE Career Center advisor, will assist with resume reviews and job searches. Ideally, you will be able to schedule interviews during the late Fall semester and early in the Spring semester. Of course, your prospects for finding a job are improved if you have had summer technical engineering jobs or have participated in research projects. Most students have at least one job offer in hand by the middle or end of the Spring semester their senior year. Additional information is available at the Career Center CIT webpage (http://www.studentaffairs.cmu.edu/career/college-specific-resources/cit.html).
11.0 Graduate Education

11.1 Types of Degrees

Perhaps, you would like to pursue a graduate degree post-graduation instead of full-time employment. As a general rule, graduate degrees will improve your job prospects, opportunities, and ultimate career potential. An M.S. degree is considered to be similar in many respects to a B.S. degree except that there is more expertise in technical skills.

At most universities, there are usually two versions of the master’s degree. The “course option” involves course work only and can usually be completed in one year beyond the B.S. The “research option” normally takes two years, and it includes the completion of an independent project in addition to the course work. Our department offers both types of master’s degrees.

At Carnegie Mellon’s Mechanical Engineering Department, financial aid is not offered for master's degree programs; only PhD candidates are eligible for internal funding. However, M.S. students are welcome to apply for external funding. Other universities’ graduate programs may have other policies regarding financial aid. Opportunities for external aid are listed in the university's online database at www.cmu.edu/fso/.

A Ph.D. degree is desirable for research and development positions in industry and for teaching positions at universities. A Ph.D. degree is generally not necessary if you are interested in jobs that are closely related to commercial product design, marketing or sales. Also, you should note that the Ph.D. degree is not restricted to engineers who are only interested in teaching. The vast majority of mechanical engineering Ph.D. graduates today take advanced positions in industry. After completing a master’s degree, a Ph.D. degree usually takes two to three additional years to complete because of the added emphasis placed on thesis research.

11.2 Applying to Graduate School

Students most commonly pursue graduate immediately after completing the B.S. degree. However, some students obtain graduate degrees part-time while working or work for companies that provide financial aid to qualified employees who want to pursue an advanced degree. Although possible, most people find it difficult to return to graduate school after having worked in industry for a few years, as a result of additional personal and financial responsibilities. However, your path is ultimately a matter of personal preference.

If you are interested in graduate school, talk with your faculty mentor. You should then begin collecting guides and applications from potential universities no later than the beginning of your senior year. Application deadlines are usually in January, and most universities will require recent scores from the Graduate Record Examination (GRE). Most students take the GRE early in their senior year. If you take the exam in the junior year, you can repeat it during your senior year if you believe you can raise your scores.

As a rule of thumb, you should apply to about six universities. Consider applying to schools in several different “tiers.” Don’t necessarily put all your eggs in one basket by applying only to the most prestigious schools without any back-up options.
Your admittance to graduate school is also influenced by a number of factors. Grades, GRE scores, your undergraduate school’s reputation, work and project experience and the strength of your recommendation letters each play a part. The professors that you work with in courses or on special projects are important sources for references. A letter of recommendation from your advisor on a research honor’s project during your senior year can be especially important.

Usually, you will receive an admission or rejection letter from the graduate program by March. After you are accepted, it is a good idea to visit the university if you haven’t done so already so that you can examine the research program in more detail, explore the city and meet with faculty and current students.

11.3 Graduate Study at Carnegie Mellon

The Integrated Master’s/Bachelor’s program (IMB) is an exciting opportunity for students who excel academically and want to pursue both a Bachelor’s degree and a Master’s Coursework (MSC) degree in Mechanical Engineering. The application fee, Graduate Record Exam (GRE), and recommendation letters are waived. The Bachelor’s degree may be completed simultaneously with the MS degree or in a preceding semester. Courses taken for the MSC degree may not be counted in the Bachelor degree requirements. The two degrees are typically completed in 8 to 10 semesters. At least one semester of full time graduate status is required when completion of the two degrees extends beyond the 8th semester.

A student with a cumulative QPA of 3.00 or higher in the second semester of their junior or senior year is guaranteed admission into the MS degree through the IMB program. To be officially admitted, the student must complete the IMB degree program form: MechE IMB Form.

If a student does not meet the exact overall 3.00 QPA requirement, they must apply for admission via the Graduate Admissions guidelines. All portions of the application must be completed.

Please check with your undergraduate academic advisor for more information.
12.0 Other References

This handbook is updated each fall. The most recent version can be obtained on the MechE website at www.cmu.edu/me/.

This handbook supplements information contained in the Carnegie Mellon Undergraduate Catalog. The Catalog contains official descriptions of policies, courses and degree requirements. The descriptions given in the university Catalog supersede those contained in this handbook. You should consult the Undergraduate Catalog for course numbers, course descriptions, schedules and detailed explanation of the degree requirements.

The Schedule of Classes, published each semester, contains information on enrollment procedures and policies, account balances and registration locations. For enrollment questions, you can stop by The Hub, located in the lower level of Warner Hall. You can also contact enrollment services at 268-8186, thehub@andrew.cmu.edu, or www.cmu.edu/hub.

An additional helpful resource is The Word, Carnegie Mellon’s student handbook. This describes academic resources and support services that are offered to students, university policies and social activities available in the Pittsburgh area. The Word is available at www.studentaffairs.cmu.edu/theword.
Flowchart of Prerequisites for Mechanical Engineering Courses
Curriculum Template

The following template depicts the standard and recommended course sequences for the four-year B.S. program in mechanical engineering. In order to ensure that prerequisites are satisfied, and to prevent scheduling conflicts, students should discuss any significant deviation from this template with their academic and/or faculty advisor.

Freshman Year

<table>
<thead>
<tr>
<th>Fall – Freshman year</th>
<th>Units</th>
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<tbody>
<tr>
<td>21-120 Differential &amp; Integral Calculus</td>
<td>10</td>
</tr>
<tr>
<td>24-101 Fundamentals of Mechanical Engineering</td>
<td>12</td>
</tr>
<tr>
<td>33-141 Physics for Engineering Students I</td>
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</tr>
<tr>
<td>99-101 Computing@Carnegie Mellon</td>
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<td>76-101 Interpretation and Argument</td>
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<tr>
<td>21-122 Integration, Differential Equations, Approximation</td>
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<td>xx-xxx Second Introductory Engineering Course</td>
<td>12</td>
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<tr>
<td>xx-xxx Restricted Technical Elective</td>
<td>10-13</td>
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<td>xx-xxx General Education Course</td>
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### Sophomore Year

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<td>21-259 Calculus in Three Dimensions</td>
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<tr>
<td>24-221 Thermodynamics</td>
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<tr>
<td>24-261 Statics of Deformable Solids I</td>
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<td>xx-xxx Restricted Technical Elective</td>
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<tr>
<td>xx-xxx General Education Course and Experiential Learning I</td>
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<tr>
<td>24-200 Machine Shop Practice* (sophomore year-course offered fall OR spring)</td>
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<tr>
<td>xx-xxx Restricted Technical Elective</td>
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</tr>
<tr>
<td>xx-xxx General Education Course and Experiential Learning II</td>
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</tr>
<tr>
<td>24-202 Introduction to Computer Aided Drafting * (sophomore year fall OR spring)</td>
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</tr>
<tr>
<td>24-200 Machine Shop Practice* (sophomore year-course offered fall OR spring)</td>
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<tr>
<td>21-260 Differential Equations</td>
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<td>24-231 Fluid Mechanics</td>
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<td>24-262 Stress Analysis</td>
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<tr>
<td>xx-xxx General Education Course and Experiential Learning II</td>
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</tr>
<tr>
<td>24-202 Introduction to Computer Aided Drafting * (sophomore year fall OR spring)</td>
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Total Units for Fall: 21-259
Total Units for Spring: 21-260
Total Units: 49-52
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<td>24-322 Heat Transfer</td>
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<td>24-351 Dynamics</td>
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<td>24-370 Engineering Design I</td>
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<td>xx-xxx General Elective Course and Experiential Learning III 39-310</td>
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<td>36-220 Engineering Statistics and Quality Control **</td>
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<table>
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<tbody>
<tr>
<td>24-302 Mechanical Engineering Seminar *</td>
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<td>24-311 Numerical Methods</td>
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<tr>
<td>24-321 Thermal Fluids Experimentation and Design</td>
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</tr>
<tr>
<td>24-352 Dynamics Systems and Controls</td>
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<td>xx-xxx General Education Course</td>
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<td>24-452 Mechanical Systems Experimentation</td>
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<td>24-441 Design II * or Elective</td>
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<td>9</td>
</tr>
<tr>
<td>xx-xxx Elective</td>
<td>9</td>
</tr>
<tr>
<td>xx-xxx General Education Course</td>
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<table>
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<th>Spring – Senior Year</th>
<th>Units</th>
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<tr>
<td>24-441 Design II * or Elective</td>
<td>12</td>
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<tr>
<td>24-xxx Mechanical Engineering Technical Elective</td>
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<tr>
<td>xx-xxx Elective</td>
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<tr>
<td>xx-xxx Elective</td>
<td>9</td>
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<tr>
<td>xx-xxx General Education Course</td>
<td>9</td>
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<td>48-51</td>
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</tbody>
</table>

*Course may be taken either Fall or Spring

**Statistics may be taken in any semester that best fits. However, it should not replace a Calculus course or Differential Equations, due to prerequisite issues in core classes.

**NOTE:** Sequencing depends on a student’s advanced placement credit and course scheduling. Electives can be taken anytime during the sophomore through senior years. Some course requirements may be filled by other classes. Classes to pay particular attention to include:

- Seminar may be replaced by 70-340 Business Communications or 76-270 Writing for the Professions.
- Science lab requirement may be filled with 09-101 Intro to Experimental Chemistry (3 units), 03-124 Modern Biology Lab (9 units), 33-100 Basic Exp. Physics (6 units), 33-104 Experimental Physics (9 units), or 42-203 Biomedical Engineering Laboratory (9 units).
- 36-220 Engineering Statistics and Quality Control (9 units) may be taken any semester.
- 36-217 Probability Theory and Random Processes or 36-225 Introduction to Probability Theory are options for students in double majors that require one of these courses instead of 36-220.

**Experiential Learning (EL) (39-210, 39-220, 39-310)**

Being curious and constantly looking for inspiration are critical parts of lifelong learning. To be successful as an engineer and as a citizen, your education must not stop when you graduate from Carnegie Mellon. The EL requirement aims to encourage a habit of lifelong learning about innovation and the growing internationalization in engineering and, indeed of many other aspects of the modern world. The goal of this requirement is to help inspire the habits of being open to new ideas as successful, innovative engineers.

To do that, during both semesters of your sophomore year, and the first semester of your junior year, we require you to choose a few related activities that are not part of your formal course work. Examples could include:

- Attending approved seminars and then submitting a one page write up of your thoughts on what you heard;
- Participating in one of the "country courses" or other weekend courses that the University runs (for details see: www.cmu.edu/weekend-today/index.html)
- Holding an official leadership position (eg President, Vice President, Secretary, Treasurer) in a student organization.

Students must register for the three Experiential Learning courses (39-210, 220 and 310) to get access to each course’s Blackboard page, where students can find more information about the requirements. Please note that the paper submission deadline for Experiential Learning is November 1st for fall semester, and April 1st for spring semesters.

- See more at: Experiential Learning

*Always refer to the Carnegie Mellon Undergraduate Catalog for the official degree requirements.*
Frequently Asked Questions

Advising

How does the MechE department handle advising?

Bonnie Olson or Eva Mergner will be assigned as an academic advisor when you declare Mechanical Engineering as your major in March of your first year. They will continue to assist you with any curriculum questions and registration issues for the remainder of your studies. You are encouraged to find a faculty mentor by the end of your sophomore year to ask questions relating to career decisions, grad school, research, summer internships and course content. Information on the website, introductions at the sophomore dinner and faculty visits during sophomore classes will assist you with your selection. In the meantime, if at any time a meeting with a faculty member would be helpful, arrangements may be made through the Academic Advisor’s office. At the end of the sophomore year, if you have not already selected a faculty mentor, one will be assigned for you.

Can I change my faculty mentor?

Yes. If you would like to change your faculty mentor, stop by Scaife Hall 415/416.

How do I notify the department when I have chosen a faculty mentor?

Fill out the survey at the end of the sophomore year with your first or second choice of an advisor.

How can I be certain that I am completing all of the requirements for my degree?

Read and understand the requirements for the degree as described in the Undergraduate Catalog, and keep track of your progress. The Academic On-Line Audit on the Hub website is a helpful tool. Email Bonnie (bonnieo@cmu.edu) or Eva (emergner@andrew.cmu.edu) or stop in Scaife 416/415 to review your academic progress, and to have the degree requirements explained to you. Try NOT to do this during registration week or the first week of classes!

CIT General Education Requirements

What courses do I need to take in order to satisfy CIT’s general education requirement?

All students complete 76-101 Interpretation and Argument.

Seven additional classes from an approved list on the CIT General Education Website are required:

http://engineering.cmu.edu/current_students/services/general_education_requirements/general_education_2016/index.html
• People Places and Cultures (PPC- 9 units)
• Writing/Expression (W&E-9 units)
• Social Analysis and Decision Making (SDM-9 units)
• Innovation and Internationalization (I&I-9 units)
• 3 General Education Electives from the above categories or from CFA, Tepper or DC not on the General Education Exclusions page(27 units)

These requirements are detailed in the Undergraduate Catalog, in the Carnegie Institute of Technology section, under the heading General Education Program for CIT Students.

*Can I take a performance course offered by the College of Fine Arts more than once and receive credit?*

Yes, as long as each performance course includes material pertaining to the theory or history of the subject. Performance courses can be used to satisfy the General Education Electives or free electives.

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**What courses can replace Junior Seminar?**

70-340 Business Communications or 76-270 Writing for the Professions may replace the two unit Junior Seminar course. Either of these courses may also be used to satisfy one of the H&SS/CFA non-technical electives.

**What courses can replace Experimental Chemistry?**

Mechanical engineering undergraduates must satisfy a Science Laboratory requirement to graduate, normally by passing 09-101 Introduction to Experimental Chemistry (3 units). Students can also satisfy the Science laboratory requirement by passing one of the following courses:

- 03-124 Modern Biology laboratory (9 units)
- 33-104 Experimental Physics (9 units)
- 42-203 Biomedical Engineering Laboratory (9 units) (BME double majors)
- 33-100 Basic Experimental Physics (6 units)- limited enrollment

These courses may have prerequisites and tight enrollment limits that students should consider in their planning. Courses will also count as a free elective.

**Courses and Units**

*What is the normal number of units that I should take each semester?*

382 units are required by the mechanical engineering department for graduation. On average, therefore, you should take about 48 units per semester in order to complete the program in four years. The actual number of units taken each semester will depend on specific courses that are taken, however. The number of units taken in any given semester can vary, as indicated in the curriculum as described in the Undergraduate Catalog.
What is the minimum number of units required for full time status?

In the College of Engineering, a student must complete 36 factorable units of coursework in a semester to be considered a full-time student.

Can I register for an overload of units if I want to?

Students with a 3.0 QPA or higher may register for an overload of up to 12 units. Applicable students receive an increase in maximum units about a week after registration or after final grades for the current semester are factored. Overloads greater than 12 units or other exceptions must be approved by the engineering college’s Office of Undergraduate Studies in Scaife 110. Freshmen and transfer students are required to take a normal workload during their first semester of enrollment.

Will I be able to take all the courses that I need in order to complete my major within four years?

Yes. The mechanical engineering program is designed to be completed within four years. In fact, it is also possible to complete minor and certain double major programs within the four year period without a course overload.

Mechanical Engineering Technical Electives

How many elective slots are available to me within the mechanical engineering curriculum?

There are a total of six elective slots. Of those six, one must be a mechanical engineering technical elective; four can be any course in the university except for a physical education or ROTC course; one can be any course offered by the university.

What courses can I take in order to satisfy the requirement for the mechanical engineering technical elective?

A list of the acceptable courses is given under the heading Technical Elective Courses in the mechanical engineering section of the Undergraduate Catalog. These courses must be electives offered by the mechanical engineering department and have a course number of 24-XXX.

Certain instruction-based mechanical engineering graduate courses can also be used to satisfy this requirement, provided that you have met the prerequisites and have obtained the approval of the instructor.

What courses in the Mechanical Engineering Department cannot be used to satisfy the technical elective requirement?

The courses 24-391/392 Mechanical Engineering Project and 24-491/492 Departmental Research Honors cannot be used to satisfy the mechanical engineering technical elective requirement. 24-201, Engineering Graphics, is also unacceptable.

Can a CIT Interdisciplinary Course 39-XXX be used to satisfy the department’s technical elective requirement?

No. The intent behind the technical elective requirement is to increase your exposure to mechanical engineering and obtain depth in certain elective areas. Other 39-XXX technical courses can be used to fill your five other elective slots.
Minors and Double Majors

What should I do in order to begin a designated minor degree program that is offered within the College of Engineering?

Designated minors within the college of engineering are described in the Undergraduate Catalog in the section Undergraduate Designated Minors in Carnegie Institute of Technology. Designated minors, and the faculty members who are the primary points of contact, are as follows:

<table>
<thead>
<tr>
<th>Program</th>
<th>Contact</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation &amp; Control</td>
<td>Professor Erik Ydstie</td>
<td>DH 4210A</td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>Professor Conrad Zapanta</td>
<td>Scot 4N205</td>
</tr>
<tr>
<td>Colloids, Polymers and Surfaces</td>
<td>Professor Annette Jacobson</td>
<td>DH 3102B</td>
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<tr>
<td>Electronic Materials</td>
<td>Professor David Grieve</td>
<td>HH B204</td>
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<td>Professor Lisa Porter</td>
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<tr>
<td>Environmental Engineering</td>
<td>Professor Neil M. Donahue</td>
<td>DH 2116</td>
</tr>
<tr>
<td>Global Engineering Studies</td>
<td>Treci Bonime</td>
<td>SH 110</td>
</tr>
<tr>
<td>Materials Science and Engineering</td>
<td>Professor Michael McHenry</td>
<td>REH 243</td>
</tr>
<tr>
<td>Mechanical Behavior of Materials</td>
<td>Professor Warren Garrison</td>
<td>WEH 3303</td>
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</tbody>
</table>

If you are interested in following a designated minor, contact one of the faculty members listed above. Although students can generally complete a designated minor without increasing the number of units required for graduation, early planning is important.

Is it possible to pursue a minor in another engineering department?

No. At this time, departments within the College of Engineering do not offer minors that are available to students that are majoring in another engineering discipline. The college does offer minors in Engineering Studies, and in Technology and Policy, but those are available only to students who are not majoring in an engineering discipline.

What is the procedure to minor or double major in a department outside of the College of Engineering?

Essentially every department outside the college of engineering offers a minor degree program, so your choices are very broad. You should contact the main office in the department in which you would like to minor, and inquire about the minor degree requirements. They will provide you with information that describes the courses that are necessary to complete the minor. In addition, they will certify upon graduation that the requirements for the minor were indeed completed. This same procedure is to be followed in the case of a double major.
It is important to note that in certain popular fields, such as computer science and business administration, it can become difficult to enroll in the necessary courses. The ability to complete a minor or double major in some fields is determined by the ability to enroll in the necessary courses. The priority for enrollment is based upon a student’s primary major field, and not the double major or minor area.

**QPA Requirements**

*I am failing a class that I’m taking. What is the university’s policy on dropping or withdrawing from the course?*

You can drop a course on or before the drop deadline for that semester. The course will be removed from your record, and it will not appear on your transcript. However, if you are a full-time student and you decide to drop the class, you must maintain a course load of at least 36 units in order to maintain full-time student status.

After the drop deadline, but on or before the last day of class prior to the final examination, you can request to withdraw via a form that must be signed by your advisor. The grade of W will be assigned, and it will appear on your transcript.

*Can I retake a class in order to get a higher grade?*

You are allowed to repeat a course in which you obtained a passing grade. However, the grades from both enrollments in the course will appear on the transcript; both will be used in calculating the total QPA; and both will be used in determining your class rank. The units, however, are counted only once. Therefore, if a course is taken more than once, the additional enrollments cannot be used to satisfy another curricular requirement, such as a free elective.

Note also that the mechanical engineering department has a requirement that students achieve a QPA of 2.00 or higher in all required mechanical engineering courses. You may repeat a course in which a grade below C was received in order to achieve the QPA requirement, and the highest grade obtained will be used to calculate the average required by the mechanical engineering department.

*What is the minimum QPA requirement in order to maintain good academic standing?*

A student will be placed on academic probation if their QPA during one semester of the first year is below 1.75, or if the semester QPA of a student in good standing beyond the first year falls below 2.00. Students who are subsequently unable to maintain minimum QPA standards can receive further academic actions leading to continued probation, suspension, or being dropped from the program.

*What is the minimum QPA required in order to graduate?*

The College of Engineering requires that the cumulative QPA be 2.00 or higher for all courses taken after the first year. In addition, the mechanical engineering department requires a cumulative QPA average of 2.00 or higher for all required mechanical engineering courses.
Do first-year grades count towards my QPA?

First year grades are included in the calculation of your cumulative Carnegie Mellon QPA. Your first year grade for 24-101 Fundamentals of Mechanical Engineering is included in the calculation of your average for required mechanical engineering courses. However, the college’s 2.00 QPA requirement at graduation is based on courses taken after the freshmen year.

How do I earn Dean’s List commendation?

The criteria to make the CIT Dean’s List is a QPA of at least 3.75 while completing a minimum of 36 factorable units and earning no incomplete grades during a given semester.

What is required in order to graduate with Mechanical Engineering Departmental Research Honors?

You must have a QPA of 3.2 or higher at graduation and have completed at least 18 units of research under 24-491/492 with a grade of B or better. A written thesis is required for Honors recognition at the graduation ceremony. A student who completes all requirements for CIT Research Honors (39-500 18 units) will also receive Departmental Research Honors recognition at commencement provided the project is completed under the supervision of a mechanical engineering faculty member.

Study Abroad

I would like to study abroad for a semester or an entire academic year. Where are such opportunities available, and where can I get further information?

The first step is to contact Bonnie Olson in Scaife 416 or Eva Mergner in Scaife 415. The MechE Study Abroad Handbook lists schools with appropriate coursework and academic calendars for students. You may want to review the university study abroad website or attend an information center. Although Bonnie and Eva can assist with suggestions of where to study, and how your experience affects your CMU studies, all details about applications, housing, financial aid, registration, etc. are handled by the office in Warner Hall.

Early planning is important- plan to meet with your advisor to discuss the options of study abroad and your Mechanical Engineering course schedule.

Transferring Courses to Carnegie Mellon

What is the procedure for taking a course, for instance over the summer, at another university or college and having the credit transferred to Carnegie Mellon?

These requests should be approved before you take the course at another institution. They are handled by the Office of Undergraduate Studies in the College of Engineering, Scaife Hall 110. There is an online submission form on the CIT website that can be found at this link: https://engineering.cmu.edu/current_students/services/transfer_credit.html.
You will also need to have a written description from the other institution which describes the content of the course. A catalog description and syllabus which lists the textbook used and the subject matter that is covered are preferred. The Office of Undergraduate Studies will determine, upon consultation with the corresponding department at Carnegie Mellon, whether the request is approved. Courses taken during a period of suspension from Carnegie Mellon University cannot be transferred.

*What grade will I need to earn in order to have the course transferred?*

The grade that you need to achieve in order to transfer the course is determined on a case-by-case basis by the College of Engineering’s Office of Undergraduate Studies.

*How many units will I receive for a transfer course?*

The number of units that will be entered on your CMU transcript for a specific CMU course number is determined on a case-by-case basis by the College of Engineering’s Office of Undergraduate Studies.

*How many courses can I transfer from other schools?*

There is currently no restriction on the number of courses that you may transfer from other universities. There is, however, a residency requirement which states that you must complete at least 180 units of coursework at Carnegie Mellon.

*From what other schools will Carnegie Mellon accept transfer courses?*

There is no master list of acceptable universities from which Carnegie Mellon will accept transfer credit. Course content, rather than the specific institution, is considered important when transferring credit. The grade that will be required to attain in the class, however, will be set by the Office of Undergraduate Studies depending on whether the school is a two year or a four year institution.